THE FLOWERS AND THEIR STORY

POPPIES. *Frontispiece*

THE FLOWERS
AND THEIR STORY

BY

HILDERIC FRIEND

AUTHOR OF

'FLOWERS AND FLOWER-LORE,' 'THE MOSAIC OF LIFE,' ETC.

WITH 155 ILLUSTRATIONS OF FLOWERS AND FLOWER STUDIES
FROM THE AUTHOR'S PHOTOGRAPHS, AND
EIGHT COLOURED PLATES

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PREFACE

THE Author holds that young people are born with a love of Nature, and that by the development of this taste the joy and usefulness of life may be greatly increased. It has been his pleasure for many years to give Nature addresses and lectures to the young, to conduct Guild and School botany classes and Field Club rambles, and in various ways to foster in our young men and maidens, as well as in our children, the love of the beautiful.

For nearly a quarter of a century his *Flowers and Flower-Lore* has been a popular and standard work; and in the present volume the results of long and patient study have been brought together. Such chapters as those on Dame Nature's Tuck-shop, Honey-pots and Honey-guides, Moss-troopers, Fairy Gold, Balloons and Floats, Flags and Banners, or Acrobats and Steeple-jacks, can hardly fail to appeal to the schoolboy; while the girls will, we trust, turn with pleasure to those on Lords and Ladies, Among the

Nobility, The Flowers of Mary, The Emerald Chalice, A Visit to the Nursery, or In the Show-room.

Botany is here made a pastime, the young mind being meanwhile stored with the most useful and pleasing facts. Difficult names and hard words are either eschewed or explained, while the real fascination of the plants is kept ever in view.

Illustrations have been freely used, because it is felt that the young will be able, by their aid, the more easily to recognize the plants when they see them growing. It will be seen that the volume has been carefully planned with a view to the fostering of the love of Nature among young people. It goes forth with the earnest hope that it will prove a fountain of delight to many.

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THE FLOWERS AND THEIR STORY

CHAPTER I

THE PERENNIAL BEAUTY

A BOTANIST went, some years ago, to a distant land to study its flowers. He was soon able to send home glowing reports of his work. Every day brought him new treasures and richer delights. When he was asked what was the secret of his success, he replied that he began work at his own door. The first day he collected the plants that grew about the house, and studied them. When they were mastered he went a little farther. He gathered what was new, but was able to leave what he had already studied. In this way, when he had to take long journeys it was not necessary to collect any plants but such as were little known or rare. Would you like to know all about the flowers? Let it be your rule, then, to pass from the well known to the

less known. Master the flower which is growing at your feet (Fig. 2). It is

The Modest Daisy.

Do you think you know all about it? If you do you will find it easy to master the other plants. Let us pick one of the flowers and examine it. What a perfect gem it is, with its 'lily-work on the top of the pillar' or stalk! Perhaps you have learned that the green part is called the calyx, and the pink-tipped portions are the petals. In ordinary flowers that would be the true description, but in the daisy we have what is called a composite flower. We shall know better what this means when we get to the next chapter. For the present we will be content to study our

> Wee, modest, crimson-tipped flower,

as Burns calls it. The flower-stalk is long and slender. It is as strong as it is graceful, and can carry the burden of the beautiful flower with ease. Let us now remove the green portion. It is made up of a dozen or more little leaves or bracts. They are very much like the sepals which form the calyx of a primrose or violet. We notice that they are separate, not grown together, as they are in many plants. Where is the calyx, then? The daisy has no calyx, because this green involucre, as it is called, takes its place. I hope we shall not think

it foolish to give the daisy's calyx a new name, for we shall see by-and-by how wise it is to distinguish things which differ. We will say, then, that the daisy has a green calyx like other plants, but for certain reasons, which have yet to be examined, this special form of calyx is called by another name.

Next we look at the petals. But we soon find that they differ from the petals of a rose or geranium. I will put three different kinds of petals side by side and show you how they differ (Fig. 7). The first is from the wild geranium, and is like a plain leaf, but coloured blue, purple, or red, that it may be easily seen by the insects. Next we have the petal of a buttercup. At the narrowest part there is a little cup called a nectary. These nectaries are found in many flowers, and usually contain a tiny drop of honey for the bees. In the third we have our daisy petal. But as the calyx is not an ordinary one, so neither is the petal. It is in reality a modified flower. The daisy has been likened to the sun—the eye of day. In its centre is the golden disk (Fig. 5), and around it we find the pink-tipped petals. These are the ray-florets. In a later chapter we shall learn more about the subject, but for the present, as we called the calyx an involucre, we will call the petals ray-florets. Floret simply means a little flower. When we have removed all the ray-florets, we have the golden centre remaining. Look at it with your pocket lens.

You must by all means get a lens, which you can carry with you wherever you go. How wonderful the disk appears now you have magnified it! We will take it to pieces as we have done the calyx or involucre, and the ray. Now do you see that this beautiful sunflower is made up of many parts, each of which is a perfect flower? We shall need our lens to see all the parts properly, and then it will appear something like what you have in the illustration. Here is one of the disk-florets as you see it under the lens in its natural condition. You will find five little teeth to each floret, showing it is made up of five petals, just as a primrose is. Then you observe inside, five little bags, called anthers. If we open one of the young florets we shall find that these anthers are full of pollen grains. Lastly, in the very centre is a curious brush. This is the pistil, and it is used by the daisy for sweeping out the pollen, so that the insects may be able to collect it and carry it off to other daisy blossoms. When the pistil has pushed the pollen out it opens, and is ready to receive the pollen, which the insects are carrying about, from another flower (Fig. 10). Is it not all very beautiful and wonderful? If you cannot find a daisy, you may see exactly the same thing in the aster or feverfew, the dahlia or sunflower, and, in fact, in any of the composite flowers, wild or cultivated, which abound around us.

It will interest you to observe that the florets in

FIG. 1.—Horse Daisy.

FIG. 2.—The Common Daisy.

FIG. 3.—Dandelion.

FIG. 4.—Oxeye and Wild Rose.

the centre, or disk, are arranged in a lovely spiral, and that the innermost flowers are the last to open. Both these facts are of importance, and it will be good for you to try and find out their meaning.

But what have we left? We took off the involucre, and found the ray. We removed the ray, and found the golden disk. We plucked the disk-florets off, and now we see the flat dish which contained all these precious things. This is the receptacle. But when we look at the daisy plant growing at our feet, we find a flower spike which has lost its florets, and the receptacle is no longer flat, but conical. Did you ever see the like of it before? What can it mean? It looks now very much as if it belonged to a strawberry. I must leave this little puzzle for you to think about. The best part of botany is not that which you learn from books. You never forget the lessons which you have been able to learn by your own effort. If you do not find any help on the question later on in this book, and you cannot solve the riddle in a twelvemonth, let me know.

I fancy by this time we are beginning to love the daisy as we never did before. We had no idea it was such a wonderful flower. To us, as to others, it has been only 'the common daisy.' But such study as this shows us that we should call nothing common which God has made. I will leave you now to find out how the daisy grows; what shape the leaves take,

and why they cling so close to the ground; why they are green, and how many mouths they have for taking in their food. It will be a long time before you have finished with the daisy, which you will now learn to speak of with great respect. Its Latin name (*Bellis perennis*, L.) was given to it by that great botanist, Linnaeus, because it is a perennial beauty. When we put a letter at the end of a Latin name, it signifies the person who gave the plant the title which it bears. So *L.* stands for Linnaeus.

If, now, you remember what the daisy has taught you, you have the key to all the composite flowers in the world. As I am to tell you more about this wonderful family in the next chapter, we will try and gather up the results of our first lesson before we bring the present chapter to a close.

The daisy is a wild flower, and is found everywhere in England, as well as in many other lands. It belongs to a very large family known as the Composites. The flowers are grouped together in heads, surrounded by a special kind of calyx known as an involucre. The parts which look like petals are modified flowers, and form the ray. These make the flower attractive, and so help the insects in their search for honey and pollen. In the centre of the flower is the disk, and the disk-florets of the daisy are perfect flowers, with a tubular corolla of five petals, containing anthers and pistil. The

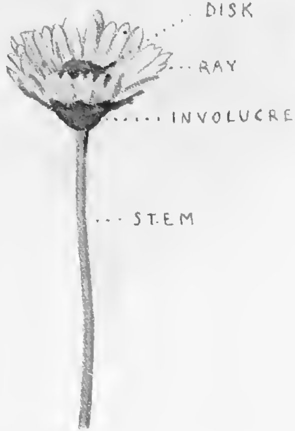

FIG. 5.—Daisy flower, with stem, involucre, ray, and disk.

FIG. 6.—Daisy flower, with stem, involucre, and receptacle.

FIG. 7.—Petals (1, 2), and ray-floret of daisy with stigma (3).

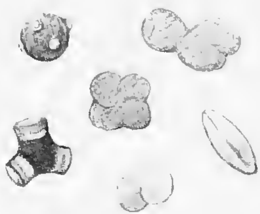

FIG. 8.—Different kinds of pollen.

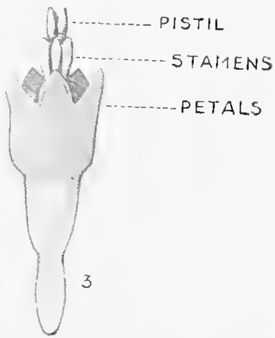

FIG. 9.—Disk florets of daisy.

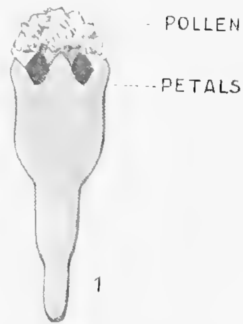

FIG. 10.—Shedding pollen.

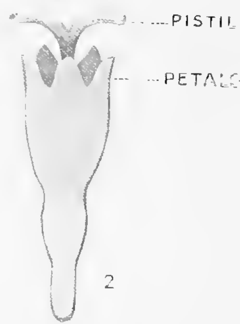

FIG. 11.—With stigmas extended.

centre florets are the last to open, and the pollen is carried from plant to plant by means of insects. When the florets fade, the receptacle begins to take a conical shape. The leaves of the daisy lie flat on the ground, but the flowers are carried on a graceful stalk, and each stalk bears a solitary head.

If, now, you will give a little attention to the plates, you will find that many of the subjects dealt with in this chapter have been illustrated. We have in our first plate not only the common daisy (Fig. 2), with its ray and disk florets, but also the horse daisy (Fig. 1), which is built up on the same plan. The dandelion (Fig. 3) has no central disk. In the next illustration (Fig. 4), we have the dog rose intermixed with the horse daisy, to show how widely the roses differ from the daisies. In the next plates (Figs. 5–11), the different parts of a composite flower are represented. This is the subject of our next chapter, while we shall study the pollen grains when we come to speak of Fairy Gold.

Look! As we have been summing up our results, the daisy's eyes have blinked. It is getting sleepy. The lawn, which seemed to be covered with tiny stars when the sun shone, appears now to be quite deserted. We will sleep as the daisies do.

CHAPTER II

THE ART OF COMPOSING

YOUNG ladies at the boarding-school are very clever at composition. Their essays are sent home for the admiration of their fond parents, and we are never weary of telling our friends what clever daughters we possess. But Nature has been engaged in the art for ages. Just as a printer picks up letters and puts them into words, or a schoolgirl selects the words and puts them into sentences, so Nature has been taking the flowers and composing them into nosegays. To-day we will look at her handiwork, and try to find out how she proceeds.

We have already learned that the little flower we used to make into daisy-chains is a composite plant. Its blossom is made up of a hundred little florets, and these are of two kinds. The ray-florets are flattened out almost like petals, and the disk-florets are tubular, something like those of the campanula or bluebell (see Fig. 14). I have said that this knowledge supplies the key to all the composite flowers in the world. If

Fig. 12.—Apple Blossom, with sepal.

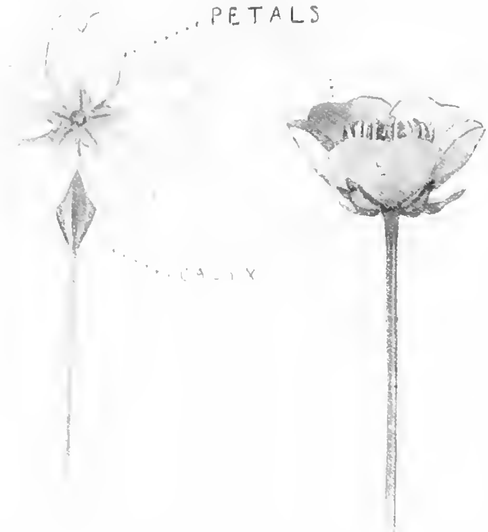

Fig. 13.—Blossoms of Primrose and Buttercup, showing petals and calyx.

we cannot travel to Japan or Australia, to Siberia or Paraguay, the flowers of these lands may be brought to us, and we shall see the asters of China and the chrysanthemums of Japan, the everlastings of Africa, and the edelweiss of the Alps; so that when we know our daisy thoroughly we shall be able to recognize all her many and beautiful relatives. We will look at those with which we are most familiar.

Here is the horse-daisy (Fig 1). The Latin name is chrysanthemum, and it is therefore next of kin to those wonderful flowers which now find their way to the shows and exhibitions all over the country. I am bound to say I love the wild horse-daisy of our meadows and railway banks better than all the wonderful chrysanthemums in the show. If we look at this ox-eye, as many folk prefer to call it, we shall see that it is exactly like our daisy magnified. There is the same involucre, the same ray, and the same golden disk. We have another wild chrysanthemum in England. It grows in cornfields, and has yellow flowers instead of white or pink. If we now look around us we shall find that this class or order of flowers is very abundant. But we shall also find that they differ greatly. And if we try to group the flowers according to the shapes of their blossoms we shall see that they fall into three sets. In some flowers all the florets will be tubular, like those in the disk of the daisy; in others, all the florets will

be ligulate, like those in the daisy's ray; while other flowers will have both kinds of florets, just as the daisy has. The word 'ligulate' means 'like a tongue.'

Suppose we put three samples side by side. We have the daisy as our well-known standard. On her right hand we may put the dandelion, because everybody knows where that may be found all the year round. Then on her left hand we put the tansy, which grows in the garden as well as in many country places. The dandelion has no tubular florets, while the tansy has no ligulate flowers. Its flower-heads are like golden buttons, or like the horse-daisy with the ray-florets removed. These three flowers, then, supply us with types of all the composites. Sometimes these flowers are so cultivated that all their tubular flowers are changed into ligulates, then we get the garden chrysanthemums as compared with the wild oxeye. What are called single dahlias are really flowers like our daisy or oxeye; while the double ones are the same flower changed by cultivation, till all the tubular disk-florets have become flat, strap-shaped, or ligulate, like those in the daisy's ray.

Now it so happens that among our English wild flowers we have so many different kinds that it is easy for us to trace the history of a daisy, and find out how it became a composite. Let us first look at some simple kind of flower, and make out its parts, then see what

FIG. 14.—Campanula, or Bluebell.

FIG. 15.—Cowslip, with Globe-flower below.

Nature has been doing to produce such wonderful flowers as the composites.

Every one knows the primrose. It has a stalk like the daisy, a green calyx which has become tubular, and a beautiful yellow flower made up of five petals, which also have grown into a tube inside the calyx. Formerly, the five sepals and the five petals were separate, as we still see them in the buttercup or rose family (Figs. 12, 13). Inside the corolla we find the stamens and pistils, and these together make up a perfect flower. Shall we master this little lesson before we go further?

Pluck a flower and examine it. You find—

1. The green sepals, forming the calyx.
2. The coloured petals, making the corolla.
3. The anthers or pollen bags on their stalks.
4. The pistils in the centre of the flower.

Some flowers have no calyx and others have no corolla. Some have no pistil and others no stamens or anthers. These are imperfect flowers, and do not concern us now.

I suppose many of us in our young days have gathered daisy-flowers and thrust thorns into them. If the thorns were far apart we had perhaps half a dozen flowers on a stick six inches long. But suppose the thorns were very close together, then we should have six blossoms in three inches, and the rays would touch each other. If the thorns were closer still, all the daisies would be in

a ring around the stick, and then we should have a kind of composite flower.

Suppose we take another illustration. If you look at the cowslip, with a dozen flowers on short stalks, and compare them with the primrose, whose flowers are all on separate stalks, you see the process of composition going on. Make the stalks of the cowslip as short as you can, and you have the flowers on the top of a stalk making what looks like one big flower. The cowslip blossoms are much smaller than those of the primrose because they grow in bunches (Fig. 15). The shorter the stalks are the smaller the flowers will become. To make room for them all to grow to the best advantage we may suppose the green sepals of the inner flowers shrinking up and disappearing, and the bracts forming an outer calyx or involucre for the whole set of flowers. Now, instead of a simple primrose, or a bunch of cowslips on long stalks, we have a dozen flowers, each with its pistil, anthers, and corolla, but surrounded by a common calyx. That is just what the tansy flower is like. Its florets are all tubular, but they have become very small and cramped.

Now a second process goes on. The flowers have combined to make a bouquet, but all the florets are of one shape and colour. The bees and insects will see them better if they can make themselves more showy. So the outer row of florets spreads itself out and forms

FIG. 16.—Hemp Agrimony and Wild Mint.

FIG. 17.—Coltsfoot (*Tussilago Farfora*).

the ray. To do this it may be necessary to change the flower in some way, and so it frequently happens that the ray-florets, which are only for show, lose their stamens and even their pistils, and become quite barren. You can see this beautifully in the guelder rose (Fig. 26). We shall come to this subject again later on, for it is very wonderful to trace the methods which the flowers have adopted for making themselves conspicuous, and so securing the visits of insects.

If we take a little trouble about the matter we shall soon find that there are true composites which act as connecting links between the most perfect forms like the daisy, and the early forms from which they sprang. Let us go early in the year to some damp meadow, or the banks of a stream. Here we may find the first signs of those large leaves which later in the year will look like rhubarb. If we look around we shall see some clumps of brownish flowers among the young leaves. These are the butterbur or water coltsfoot. The flowers have not yet formed into a single head, as in the coltsfoot or daisy—they grow into a kind of cone. In the same locality we shall be pretty sure to find another plant in the summer and autumn which will still further illustrate our subject. This is the hemp agrimony (Fig. 16); but the flowers grow in flat heads, called corymbs' by the botanists. These plants are in a kind of cowslip stage, so to speak. Their stalks have not yet

disappeared, and they do not form a compact blossom; but they show us exactly the process which has gone on in the art of composing the daisy flower.

As this process continues, and the art of composing is pushed to extremes, all the florets lose their tubular character. Sometimes they do this in a state of nature, more frequently under cultivation. Perhaps the best illustration I can give you is this beautiful one of the chicory (Fig. 18). Its flowers are a delicate blue, and they quickly droop when the spike is cut. You may find it wild in many parts of England, growing plentifully by the wayside; and in East Anglia it is sometimes seen in the fields, where it is still cultivated for mixing with coffee. The dandelion, lettuce, goatsbeard, and sow-thistle have all of them ligulate flowers only, just as the so-called double dahlias and chrysanthemums, asters, and other cultivated flowers have.

We can now, I think, take a brief survey. We found that the daisy was a composite flower, and that its florets were of two kinds, tubular in the centre and ligulate in the ray. These are surrounded by a special calyx or involucre. All composite flowers have either tubular or ligulate flowers, or both; but very often the outer florets give up their pistils or stamens, or both, that they may have their strength and beauty set apart for other purposes.

As there are about ten thousand different kinds of

FIG. 18.—Chicory (*Chicorium Intybus*).

FIG. 19.—Iris, or Flag.

FIG. 20.—Cornflowers (*Centaurea Cyanus*).

composite flowers in the world, you may be sure they present every degree of development and variety of form. Perhaps if I give you the names of a few you will be able to recall them. I have already referred to the China aster and the favourite flower of Japan (the chrysanthemum), the dahlia, and the edelweiss. Add to these the coltsfoot (Fig. 17), the common groundsel, which your canary is fond of picking, and the thistle, which forms the badge of Scotland. Then we have the chicory and dandelion, the roots of which are valuable, even though we think them common. The goatsbeard, which closes its flowers at midday, and is called 'Go to bed at noon,' is a composite. So are the wormwoods, the chamomiles, and the yarrows, all of which are bitter and wholesome—as bitter things usually are, however much we may dislike them. The sowthistle in the field and the lettuce in the garden belong here, so do the huge sunflower and the artichoke. So you see the family is a large one, and has a variety of interesting features. Many of the plants are very beautiful, but those which have the least beauty are often the more useful.

CHAPTER III

FLAGS AND BANNERS

HOW gay you looked the other day when your school had holiday, and you marched down the street to the strains of a band, waving your flags and carrying your banners! What do those banners mean? Some of you have a book about the flags of different nations, and you know that each country has a different flag or series of flags. Each has its meaning, and the study is an interesting one. We must look at it to-day in connexion with the flowers. As our simple rule is to work from the well known to the less known, we will turn again to our modest daisy. We have studied the two kinds of florets. The golden ones in the centre or disk are perfect, and bear large quantities of pollen; but if you look at the ray-florets you will find they have no pollen. They are much larger, flatter, and more highly coloured than the yellow flowers in the centre. I suppose everybody knows by this time that the bright-coloured ray is a kind of flag or signal. It is spread out during the day in order to make the flower easily seen.

FIG. 21.—Horse-chestnut in flower.

FIG. 22.—Ivy on trees, and George Herbert's church.

Now here is a subject which fills us with wonder and admiration. The flags of the nations are only of service as their uses are known. Red is usually the colour of danger, but in China it means pleasure and goodwill. If you did not know that, you might be afraid of a flag which was intended to show the friendly feelings of the people. In 1842, when Sir Harry Parkes was in Nanking, he found that 'red flags were hung out of many of the people's houses, which they told us were meant to welcome our arrival.' But if we go near a rifle range in England, and see a red flag flying, we know it means 'Beware!' It is exactly so among plants. They have a wonderful code of signals, but while red sometimes means 'Welcome,' it means at other times 'Keep clear.'

These signals are for insects and birds to read, and they are also useful for animals and man. Let us look at a few of their uses. When we see a flower with beautiful blue petals we may be pretty sure that the bees, butterflies, or moths, will soon be hovering round. Bees, like ourselves, are very fond of the colour of the sky. These blue flowers usually have delicious honey, and they want the bees to know it. We wish the bees to know it too, because they can gather up the honey for our use. It is said that a Cockney once went into the country and had some nice new milk and fresh butter. He found that the people kept a cow. Then they brought him some honey. 'Oh, and do you keep a bee as well?'

he inquired. What should we do without the bee? It is said that if all the bees were to perish we should soon lose our lovely flowers as well, because the flowers and the bees work in harmony, and if the flowers had no lovers to visit them they would have no inducement to make themselves handsome.

Suppose we try to make this clear by a study in contrasts. Pick up any wayside weed you may find, such as the brooklime in this ditch, and look at its insignificant flowers (Fig. 24). These weeds are not visited by butterflies and bees. If any kinds of insects go to them they are very tiny flies, beetles, and ants; but some of them never have visitors at all. Now look at the clovers, roses, honeysuckles, composites, mallows, foxgloves, and other showy blooms. They are always surrounded by butterflies, bees, and other types of insect life. These bright flowers are flags of welcome. If you look more closely you will see that the flowers are frequently variegated. Perhaps, as in the daisy, the centre is one colour and the ray another. But frequently the petals have different colours, or are decorated with streaks, spots, and mystic marks (Fig. 28). All these have their meaning. When marks are found on the petals, as in some of the lilies and geraniums, they lead the eye towards the nectary, and so the bee or butterfly knows where to find the honey. Now, the different creatures have their individual tastes. Brown and brick-red colours suit the

FIG. 23.—Foxglove (*Digitalis purpurea*).

FIG. 24.—Brooklime (*Veronica Beccabunga*).

FIG. 25.—Bramble (*Rubus fruticosus*).

wasps, blues and bright reds are favourite colours with the bees. The beetles are fond of yellow, and so each particular taste is met by the different kinds of flowers. The scabious puts out its blue signal for the bee, the dandelion its yellow flag for the beetles; and while the honeysuckle caters for the butterfly, the figwort shows its brownish blossoms to the wasp.

It is when we come to the fruits, however, that we see this subject in its most pleasing light. Here the colours may be warning-voices as well as welcomes. Look, for example, at the arum, or lords and ladies, which we shall study more fully in a later chapter (Figs. 29, 43).

In the autumn the brilliant scarlet fruit-spikes are very conspicuous in the hedgerows, and, like other highly coloured berries, are very much enjoyed by certain kinds of birds. But it is not every species of bird that can eat the coral-like fruits with safety. In Cumberland the plant is called Hen-drunk, and is pulled up and destroyed when found near the farmhouses, because if the fowls peck the fruits they become giddy, and act as if they had been drinking an intoxicant. It may be said that, as a rule, red berries are harmless to birds, though they may be injurious to animals. The soft pulp of the yew and the hard coating of the hips are not dangerous to children. But if we find wild plants with purple berries we should be careful how we treat them. In some places there is a plant called the deadly nightshade,

with handsome fruits which look quite tempting. They are very poisonous, and their bright colour should be taken as a flag of warning (see coloured plate, facing p. 207).

If in years to come you should have the good fortune to go abroad and see the brilliant foreign gentians and peonies, the geraniums and calceolarias, the lilies and roses, the irises and ixias, the violets and pansies, you will realize the value of this study.

Meanwhile let us watch a few of our own beautiful plants and see what kinds of insects visit the blossoms. I can hear the booming of the humble-bee. He has come in search of the foxglove (Fig. 23). See how beautifully he finds his way into the open blossoms. Or he has scented the dragon's mouth. Other creatures have been fluttering around these curious blossoms, waiting in vain for admittance; but the moment the humble-bee arrives and sets his foot on the doorstep, the door opens and he goes inside. The flower closes upon him, and he is lost to sight, but in a moment we hear him returning thanks for the kindly welcome he has received, the door opens, and he flies away with an air of importance, which puts the doctor and the parson in the shade.

Most of the peas, beans, and other plants which have flowers shaped like butterflies are visited by bees. These intelligent creatures recognize them readily, and know exactly where to alight when they are in search of honey. When they see the flag of welcome, they drop on to the

Fig. 26.—Guelder Rose.

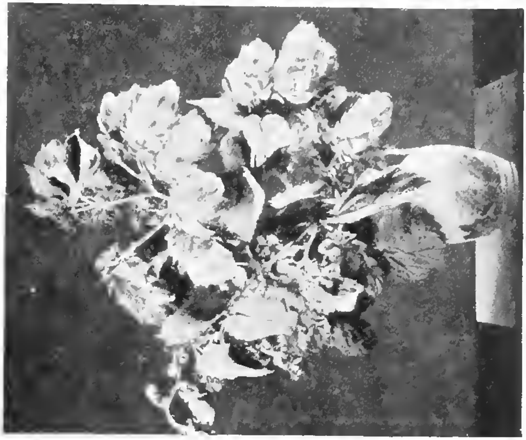

Fig. 27.—Hops.

D

flower, which instantly springs open, just as the door of your magic cave does when the mystic words are pronounced. It will prove a never-failing source of delight to you to watch the bees as they visit the golden gorse or broom, the vetches and trefoils, the scarlet-runners, and the other flowers belonging to this beautiful order. It is not my wish to tell you all there is to be known on this subject. It is enough that I have called your attention to a few facts which will not, perhaps, be pointed out to you in the botany lessons you receive at school. Let us then say, once for all, that the brilliant petals and fruits, the highly coloured spots and markings of our wayside blossoms are intended, in the main, to arrest attention. The different colours and shapes appeal to different kinds of insects, birds, or animals, and when a plant is visited, and a service rendered, the visitor is almost always rewarded for his pains with delicious nectar or more substantial food.

CONVOLVULUS.

bindweed, which has such a wonderful habit of climbing up the nettles which we dare not touch for fear of stinging ourselves, or winding its way in and out among the hedgerows (Fig. 30) There is a smaller kind which is very fond of the cornfield, and winds itself about the wheat or oats till it almost chokes them. The plant is called withywind in some places, but it is also known as cornbind, and bearbind. The farmers do not like it, because it is very hard to root up when it has once got into the ground. The larger kind, with its beautiful trumpet-like blossoms, is often known as hedgebells or lady's nightcap. There is a third kind which grows by the seaside, and is, I think, almost prettier than her sisters. The bindweeds climb by means of their stems. In this they resemble the hop, which most of us have seen growing in Kent, Sussex, Worcestershire, or some other part of England. Now, though the two plants, the hop and the bindweed, have the same habit, they are not at all closely related to each other. The hop has such lowly relatives as the nettle, and such noble kinsmen as the mulberry, within its wide family circle. How different they are from each other! The mulberry grows into a stately tree. Its leaves provide food for the beautiful silkworm, and its fruit is as delicious as the choicest blackberries. But the nettle stings and irritates us. Did you ever try to catch a simpleton by telling him that 'Nettles don't sting this month'? Which month do they sting?

The scarlet-runner, too, which is grown in your gardens, has the same way of reaching a good height as the hop and the bindweed. This plant belongs to the pea family, and we shall presently see that other kinds of peas and beans climb by a very different method. Suppose now we were to look at the beautiful honeysuckle, as it grows in a wood near a hazel bush. The stem of the honeysuckle twines about the nut-wood, and, after a while, clings to it so closely that the hazel wood grows around the woodbine after the fashion of a huge corkscrew.

How different from all these is that very beautiful little parasite, the dodder! Its tiny thread-like stems interwine in such a way that you might imagine they were a skein of silk which the kitten had been trying to unravel (Fig. 31). Before I pass on to the next class let us try and remember the principal kinds of stem climbers. Besides the convolvulus and hop (Fig. 27), the bean, honeysuckle and dodder, there is a plant which belongs to the family of docks and sorrels. Its leaves are very similar to those of the bindweed, and it is called the climbing knotgrass (*Polygonum convolvulus*, L.), or black bindweed. Then there is the black briony (*Tamus communis*, L.), which is very common in our hedgerows and thickets, and has red berries in the autumn. In foreign lands the number of twiners is very great. You will see by the illustration that some revolve one way and some

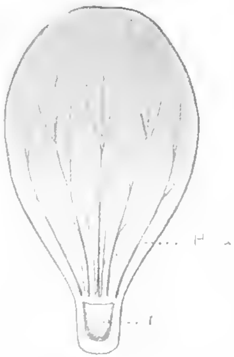

FIG. 28.—Petal with honey-guides (H.G) and nectary (N).

FIG. 30.—Wild Convolvulus.

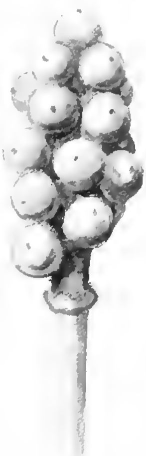

FIG. 29.—Fruit of Arum.

another (Figs. 32, 33). In a few cases the plant has the power to climb either way, just as some people can use their left hand as well as their right.

Perhaps we have hardly thought of the roses and brambles as climbers, but they certainly do a good deal in this line (Fig. 25). Instead of using their stems, however, they hitch themselves on to the surrounding plants by means of the sharp prickles with which the stems are studded. If you have ever tried to gather a bunch of wild roses, or fill a basket with rich purple blackberries, you know how your hands and clothes have suffered. The prickles are of quite a different nature from the thorns which we find on the gorse or the hawthorn. In the hawthorn we find young branches which have never properly developed; and in the gorse it is the leaves that have been hardened into spines. But the hooks on the rose and bramble come from the bark or skin only, and that is why they are so easily torn off. If your father has a microscope you might ask him some evening, when he is in a good humour, if he will show you a section through a thorn on the wild brier.

Have you ever found your clothes covered with little burs after you have been for a walk in the country? I cannot tell you without seeing the seeds which, out of the many kinds of 'sweethearts,' they may be, but you will be sure at some time or other to find goosegrass or cleavers on your dress. Now, these seeds belong to

another kind of climber, and the plant which bears them uses the same means as the brier and bramble do to rise in life. But goosegrass (*Galium Aparine*, L.) and her sisters are annual plants with very slender, delicate stems, and they do not form wood as the brambles do. So their prickles will not hurt you, though they are wonderfully tenacious (Fig. 37).

The beautiful Virginian creeper, whose foliage is so attractive in the autumn, is a very ingenious climber. There are different species, and each has its own way of rising in the world; but I have drawn an illustration of one kind which has developed suckers on the ends of its tendrils (Fig. 35). These hold fast to a brick, just as does the sucker to which I had already referred.

I need not stay to tell you about the ivy (Fig. 22) with its curious false roots, which fix themselves into the wall or the crevices of the tree; nor the creeping fig, which looks so cool and refreshing with its wealth of green. But I must not close this chapter without bringing under your notice those interesting plants which have set apart some of their leaves for the purpose of making tendrils, which shall enable them to climb.

The best known among this class of climbers is the pea. Go into the garden and see how beautifully it has wound its slender tentacles around the twigs of the sticks which the gardener has placed by its side. Several of

FIG. 31.—Dodder (*Cuscuta*)

FIGS. 32, 33.—Right- and left-handed climbers.

FIG. 34.—Pitcher-plant (*Nepenthes*).

the vetches or tares in the fields, hedgerows, and waysides have done the same, and these flowers are all closely related. The peas, beans, vetches, tares, clovers, and many other plants belong to the Legume family, sometimes called Papilionaceae, because the flowers resemble a butterfly.

I must not forget in closing to mention the plants which, like the clematis or old man's beard, climb by means of their leafstalks, which they are able to bend around a support in such a way that it is impossible to separate them without doing some injury. The illustration might have been taken from one of our English plants, but I have painted a curious climber known by the name of Lophospermum (Fig. 36), to show you that the plant life of other lands has many things in common with that of happy England.

Now it must be understood that I have only very lightly touched upon a wide and interesting subject. When you want to go into the matter more deeply you can get Darwin's book on climbing plants, and that will introduce you to many other books and authors. Meanwhile our study reminds us that if we cannot succeed in one way we may try another. As one plant climbs by its leaves, another by hooks, and another by its stems, so one of us may rise by using his hands, another by means of his brains.

I have said enough to show you how ingeniously

the plants solve the question, How shall we rise in life? When the steeple-jack climbs a chimney he may use a ladder, or may find it necessary to fix clamps and spikes to his shoes or legs. Sometimes we climb by twining our arms round a pole, or pull ourselves up by a rope, or cut steps in a cliff. The plants vary their methods in the same way, and seem never to be at a loss for means by which to gain their ends. You will agree with me, then, when I say that the study of botany is very useful and inspiring, since at every turn it supplies us with helpful lessons and stimulating illustrations.

FIG. 35.—Virginian Creeper (*Ampelopsis*), with suckers.

FIG. 36.—Lophospermum, the petioles used for climbing.

CHAPTER V

MOSS-TROOPERS

IN the 'good old times' there existed in the north of England and Scotland a body of men who lived by waylaying, robbing, and even murdering their fellows for the sake of what they could get. As they were in the habit of retiring for safety to the dangerous mosses or fens, those treacherous morasses where a stranger might easily lose his life, they were known as Moss-troopers. Strange to say, among the plants of this and other lands there are many which live by sucking the blood and life-juices of flies and insects, and as they are a very wonderful group we cannot omit the study of their treachery. They are usually known as Insectivorous plants, and are not only numerous, but belong to various genera and orders.

The best known of all these moss-troopers is the little sundew (Fig. 38). In our flora there are three species, all of which I have found in those very mosses which the troopers used to infest in the days of auld lang syne. But the commonest, and the one which is most often

found, is the round-leaved (*Drosera rotundifolia*, L.). Its leaves are often little longer than a sixpenny piece, but they are covered with threads tipped with dew. This dew-like liquid is sticky, and as it glimmers in the sun it proves very attractive to the tiny insects which are always to be found in large numbers in boggy places (Fig. 39). But when the insect alights on the leaf it finds its fragile frame sticking fast, and the more it tries to escape, the more entangled it becomes. It is caught as securely as a fly in a spider's web. In a short time all the little threads or tentacles have turned themselves towards the fly, and made escape impossible. Then its juices are extracted, and the dry, indigestible parts thrown away. It all sounds very horrible, and at first we are disposed to treat the sundew with scant respect. But, then, it is not for us to pick and choose. We are studying nature, and it is our duty to try and learn all we can about every phase of the life of the flowers.

Let us halt here, then, to ask what this thing means. Plants, like ourselves, must have food, and if they are to thrive, the food must be suitable to their needs. Plants and animals both require a certain substance called nitrogen, and as there is nitrogen in flies, and it is often wanting in the bog, the sundew catches the flies for the sake of the nitrogen. I will not trouble you with any further details about this point, but pass

FIG. 37.—Cleavers or Goosegrass (*Galium Aparine*).

FIG. 38.—Long-leaved Sundew.

FIG. 39.—Butterwort and round-leaved Sundew.

on to notice some of the other plants which live in the same way.

In the place of the drosera or sundew, some countries have plants whose leaves are very long (*Drosophyllum*. Fig. 48A), and covered with glands, which look, when magnified, almost like hundreds of silver studs all around the leaves. These feed just in the same way. Get your father to take you some day to the Botanical Gardens at Kew, Oxford, Cambridge, Edinburgh, or Dublin, and there you shall see the plants for yourself. Then ask him to read to you the wonderful book by Darwin on Insectivorous plants.

But see! Close by the sundew is another plant in the bog, which is playing the same game. It is the butterwort (*Pinguicula*, Fig. 39), and here again we have three different species. These plants are plentiful enough in the north, though rare in the south of England. In the Lake District, and in Scotland, they seem perfectly at home. But the butterwort adopts quite a different method from that which is employed by the sundew. Its leaves curl over from the margins, and so entrap the flies which have been attracted by their smooth, greasy appearance. In Lapland these leaves are used to curdle milk, and that is probably due to the fact that they contain an acid which is able to digest insects. The Latin name is from *pinguis*, and sets forth the buttery appearance which has won it the English name of butterwort.

Look in this ditch. You see some spikes of yellow flowers. They belong to the bladderwort (*Utricularia*) of which again we have three species. When I say this, I ought to remark that some botanists make more than three species of sundew, butterwort, and bladderwort, but at least three good species may be found; and, after all, I am not here troubling you with figures and names, because I want to get behind them to the beautiful and interesting facts of plant-life. Now, in the case of the bladderworts, we have quite a different piece of apparatus. It is still the leaves which do the work of trapping, but they do it in a very ingenious way. The leaves of our native species float in the water, but this is not the case with all the forms which are found abroad. They are cut up into a number of segments or threads, on which you will see tiny traps or pitchers (Fig. 40). The water-mites, or animalcules, as they are called, slip into these traps, but, once inside, there is no retreat!

'Come into my little parlour,'
Said the spider to the fly.

Beware of the spider's web, and the pitcher of the Utricularia.

In some countries there is to be found a curious plant known as the Venus flytrap. You will see it at the gardens when you go to look at the sundews and other moss-troopers. Its leaves are made up of two parts, which clap together when a fly alights on them, and so it captures

its prey, just after the fashion of those ugly rat-traps which used formerly to be set to catch rabbits, rats, and other creatures. We do not find this ingenious plant in our English mosses, but in our native flora we still have quite a number of other plants which are capable of catching flies and insects.

No doubt many of you have seen the teazle, and have observed the way in which the leaves grow together around the stem, and form a cup which is often partially filled with water and rubbish. It frequently happens that insects of various kinds are found in these natural basins, and there is every reason to believe that the plant absorbs the moisture and the nitrogen which is so obtained.

We have also some plants which are called the Catch-flies (*Silene*), and if you live in the Midlands you will perhaps be able to get the Nottingham Catchfly, and examine it for yourselves. In this case the stem and calyx are sticky or viscid. When the wind blows it often covers them with tiny grains of sand, and you will usually see a number of little flies and insects captured by the sticky hairs. Several of the plants in this order (*Caryophylleae*), which includes the pinks, campions (Fig. 41), stitchworts, and sandworts, have viscid stems, and though they do not trap insects as the sundew and butterwort do, they probably make use of these sticky hairs for that purpose.

Our chapter would not be complete if we did not give a few words to that wonderful group of prodigies of the plant-world known generally as Pitcher-plants (Fig. 34). They are very numerous and varied, and, like the Venus flytrap, may be seen at Kew, or any of our botanical gardens. It is now many years since they were first discovered and described. They are found, in one form or another, in many foreign lands, from California to the Malay Archipelago, where I have seen them growing on the trees, and producing a liquid of which the weary traveller is sometimes glad to avail himself, in spite of the flies and other creatures which the pitchers contain.

While some grow on the trees, in the same way as lichens do in England, others grow on the ground. The pitchers are formed by the leaves, and often have a lid, something after the fashion of a coffee-pot. In some cases there are special baits put out to attract the insects, but when once they have entered the trap it is impossible for them to escape. 'Abandon hope, all ye who enter here,' might well be the motto.

I do not wish you to suppose that all plants which grow in bogs and fens are so bloodthirsty as the sundews and butterworts. The lovely asphodel, the bogbean, the mealy primrose, the yellow globe-flower, the sweet gale, the rare orchids, the cotton grass, the marsh valerian, and hosts of other delightful flowers and shrubs are to be found here, all of which are innocent as a child.

FIG. 40.—Bladderwort (*Utricularia*).

FIG. 41.—Ragged Robin and White Campion among grass.

Some of my most delightful days have been spent among the glorious flowers of the bogs, and their wonderful contrivances for obtaining a living are always a source of wonder to me. Wherever you can find a boggy place, there you are certain to alight on many things to make you think. And the great advantage of botany is, that it is a science of observation. No one can be a botanist who has not learned to use his eyes.

CHAPTER VI

LORDS AND LADIES

MARCH has scarcely had time to herald her arrival in the fussy way which she loves—coming in like a lion to go out like a lamb—before we find proofs in every bank and hedgerow that the spring is coming. Among these welcome signs there is one to which we will, in this chapter, give our special attention. It will be observed that in many places a clump of large, glossy green leaves has begun to give relief to the sombre browns and drabs with which we have for months past been familiar. These leaves have a way of their own of unfolding to the sun, and as we observe them we shall be reminded of the great variety of ways in which the operations of nature are daily being carried out.

We are in the presence of the well-known arum and are at once provided with a subject of the deepest interest. There is not a point in the life-story of this wonderful plant which may not be studied with profit as well as pleasure. The popular name of lords

THE WILD ARUM.

and ladies might easily be used as a text if we wanted to study the social life of to-day. But there are many other names by which the plant is known, such as cuckoo-pint, parson-in-the-pulpit, old-man's-plaything, and the like, which I can at present do no more than mention.

In the plant realm the arum is associated with high life, for it belongs to a curious group of flowers which have been strangely modified and developed in the course of ages—a group which may be called the aristocracy of the floral realm. The arum lily (Fig. 42), which may be seen in the spring in greenhouses and window-gardens, is a relative. So is the giant arum of Eastern lands. This huge monster has a spadix or central column which rises to the height of a man, while the hood is a yard across. Our little arum is a dwarf by the side of such a Goliath, but it may well be proud of its associations.

Let us begin with the leaf, since that is the part of the plant which first comes under our notice (Fig. 43). Here we find, at the outset, a striking feature. The plant belongs to the division which contains the lilies. You will learn more fully in a later chapter, that all flowering plants are divided into two great classes, the Monocotyledons and the Dicotyledons. Among other things we find that the first group (the Monocotyledons), which contains the grasses, wheat, daffodil,

lily, and many other plants, has leaves with parallel veins.

The second class (or Dicotyledons), which includes the rose, geranium, mallow, buttercup, and their numerous relatives, is distinguished among other things by its leaves having a network of veins. The arum, however, which, by reason of its being a monocotyledon, ought to have parallel veins, defies the law, and has the courage to strike out a new line for itself. Its leaves will therefore be found to have reticulate veins, something like those of the violet, which grows close at hand. So our lords and ladies set us a good example, for they decline to be tied down with a piece of red tape. It is always interesting to study these exceptions to the rule, for they show us that Nature will not be put into fetters of iron. All rules have their exceptions, and every family and order is linked on to every other by some such intermediate form as this. So, then, the arum has the leaf-form of a dicotyledon while it belongs to the monocotyledons. If you would like to see this point illustrated a little further, try and find the curious butcher's broom. This plant has no leaves whatever, in the true sense of the word. Look for the blossoms, and you will find them seated very modestly on the backs of the green organs called phyllodes, which take the place of the true leaves. Or look at the cactus, which may be found in almost any cottage window or

Fig. 42.—White Arum Lily.

Fig. 43.—Wild Arum (*Arum maculatum*), showing roots with tuber, spathe with spadix enclosed, and fruit.

conservatory. Here the stems are often flattened out like leaves, and the real leaves have been converted into spines, to enable the plants to survive in the constant struggle for life. One other illustration may be afforded, for in your daily walk across the common or along the country lane you cannot fail to see the golden gorse, with its sharp and piercing spines. Here, again, the leaves have been changed beyond recognition. See what an interesting thing it would be to give yourself up for a time to the study of leaves.

But we must hasten on. Let us now dig down under the leaves and root up one of the plants (Fig. 43). It has roots, naturally enough, but what has it besides? Here are a number of bodies which remind us somewhat of potatoes. And, indeed, there is a close similarity between the two. These corms and the tubers of the potato are alike storehouses, filled with starch. They are one among the many ingenious devices adopted by Nature for keeping the plants from being exterminated. Thus what was originally intended for the special benefit of the plant becomes a blessing to man; for just as the potato provides us with an invaluable food, so the corms of the arum were for a time used in commerce. Before we had the rich treasures of other lands to draw upon, the starch of the arum used to be sold under the name of Portland arrowroot. The root has also been used as a medicine.

Nature is always trying to provide against a rainy day. Should the flowers of the arum fail to produce good seed, owing to bad seasons, indifferent insects, or other causes, the plant can still live on. Should the berries never ripen, or, having ripened, should the birds neglect them because they can find elsewhere full store of winter food, still the lords and ladies have another string to their bow, another means of securing the continuance of their race.

We might now take our plant home and examine the starch granules under the microscope. What shall we say to the fact that these differ in every plant just as do the flowers and seeds? The student who has given his attention to this subject can tell us the differences between the starch granules of wheat and potato, beans and Indian corn, arum root and arrowroot. They all differ, the one from the other. What magic effects can be produced, too, upon starch by the art of chemistry, or seen in the light of the polariscope! Nature is like a vast laboratory, in which changes are constantly going on, converting the salts, acids, gases, and other lifeless materials around us into the most useful and beautiful of living forms. Think how marvellous it is that, all unseen beneath the soil, in wind and rain, snow and sunshine, the arum and potato are changing the materials on which they feed into rich stores of starch for future use.

We pass now to the flower, if indeed the curious

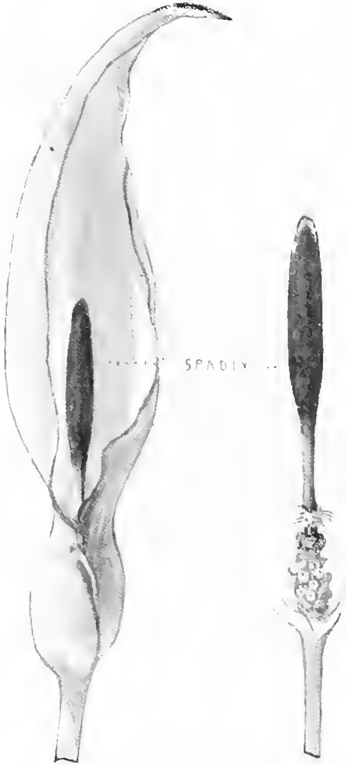

FIG. 44.—Arum spathe and spadix, (P) palisade to keep insects inside the flower.

FIG. 45.—Fruit of Arum.

FIG. 46.—Tulips.

object can be called by such a name. By a flower we generally mean a number of petals, surrounded by a green calyx, and associated with a number of stamens and pistils. But where are the petals or calyx, the stamens or pistil here? The shape of the arum flower is so peculiar and interesting, that when it has once been seen it is not likely again ever to be forgotten. Under a delicate hood—which you must call a spathe, if you please, or you will not pass for a learned botanist—you find a spike (the spadix) rising up from the middle of the flower like a red-hot poker (Fig. 44).

What is this? Has it any use? We may call it my lady's liveried servant! It is, in other words, the coat of arms of the establishment. It attracts attention. And, pray, who will pay any attention to such an advertisement? Just look inside and you will see. At the bottom of the flower are a number of tiny insects creeping about covered with golden dust. Why don't they fly away? Because they have been entrapped. The arum has some work for them to do in return for the honey she has provided. Around the entrance to her proud domain she puts a palisade (*p*). Any insect that likes may enter the enclosure, but once inside there is no escape until a certain stage in the life of the flower has been reached.

If you will take out the spadix from the hood or spathe you will observe a ring of hairs about midway. These point downwards like the sticks in a lobster-pot,

and so cannot be passed by an insect which wants to fly away. In time, however, the plant sheds its pollen, dusts the insects with it, supplies them with a drink of nectar, and then lets her gates swing open. The insects are now at liberty to go where they please, and many of them naturally go to the next arum flower, carrying their precious burden of pollen with them. When the flowers have been fertilized, the poker-like spadix disappears, the hood or spathe falls away, the leaves droop and die, and nothing is left but the green fruit stalk, around which you will now find a number of unripe berries.

We must now leave the plant till the autumn, when we shall easily be able to find it again by means of the brilliant spike of coral-red berries (Fig. 45). Much might be said about the colour of these fruits and the reason for the same. Here, as in the case of the spadix, the brilliant colour is intended to advertise the fruits. The seeds are to be distributed, and birds are needed for the business. But birds do not believe in doing their work for nothing any more than we do. They are always asking for their wages, and Nature, who is ever just, responds to the appeal. Hence the seeds are surrounded by a rich but poisonous pulp. This poison, as is often the case, acts only on certain classes of birds and animals. It is perfectly harmless if taken by thrushes and other birds, who therefore devour the fruits and scatter the seeds. Some seeds, it appears, will not

Fig. 47.—White Lily (*Lilium candidum*).

Fig. 48.—A Study of Narcissus blooms.

grow until they have passed through the body of a living bird or other creature. When speaking of the daisy I showed you how the receptacle grew after the flowers had been fertilized. You see the same thing here, and the illustration should reveal the reason.

It would take me too long to tell you all the other wonders connected with the lords and ladies, and as I shall have to refer to them again in another chapter we must be content here with one other curious fact. It is well known that when flowers are 'setting their seeds,' as the gardener calls it, they become much warmer. It is not easy to test this with ordinary flowers, but the heat of arum has often been proved, by the use of a thermometer, to rise several degrees at the time when the insects visit it. It is really doing the same kind of work as is going on in my grate whilst I am writing. A state of combustion has to be kept up, and this condition is most intense and active when the plant is busy about its most important duty.

Is not the arum, then, a truly wonderful plant? It glows like a fire, and poisons like a wizard. It stands guard like a policeman, but gives as lavishly as a prince. It ranks with the lilies, but has leaves like a dicotyledon. It grows in a hedgerow, but has giants for its kinsmen. It despises petals and sepals, but has a wonderful spathe and a curious spadix. We have no more marvellous flower in the country.

CHAPTER VII

A PLEASING PASTIME

THE Easter holidays had come, and there was quite a large family gathering at the Knowle. Most of the young people had been taking out-of-door lessons in Nature-study during the term, and they felt quite at a loss to know what to do when the usual hour for a ramble came round. All lessons were laid aside. Mother insisted that holidays were not holidays if the children had home lessons. What was to be done? Among the guests was a young lady who was very fond of flowers, and to her the girls went for help. 'Can you not give us some lessons in botany?' they asked. The answer was as follows: 'I cannot give you lessons, but if you are so anxious to learn I think I can direct your studies. This morning I should like you to go into the garden and grounds, and find me a specimen of every plant whose parts are in sets of three.' And away they went.

Little Muriel soon found some shamrock. She was sure that was what Miss Flora meant. The others did

not think so, but when asked what they were going to pick they could not answer. Now it so happened that among the flowers in bloom just then the polyanthus and oxlip, the jonquil and narcissus, the daphne and doronicum, the violet and snowdrop, the hyacinth, crocus, and squill, with quite a long list of other plants, were to be found. And yet, out of the whole collection, not one could they find whose petals and sepals, pistils and stamens were in sets of three.

They examined the primrose (Fig. 53), and found that its tubular calyx had five teeth, and its corolla had five petals, though one of the children found a primrose with four petals, another with six. But these were called freaks or sports. The wallflower had four petals also, but this was the regular number. The perianth of the daphne, which blossoms before the leaves appear, was divided into four parts, and there were eight stamens in two sets of four (Fig. 115). The violet had five petals, but they could not make out the stamens and pistil, because the whole flower was so different from a simple primrose or buttercup. Then there was the daffodil, but it had six petals, and so had the different kinds of lily, and the snowdrop. 'Miss Flora was playing them a trick,' they said. 'They had tried every flower and failed.' Just then the young lady appeared, to be met only by frowns and reproofs.

'Very well,' replied the new teacher, 'suppose we

try it another way. Do you know your tables ?' All answered, 'Of course we do,' and they began—

'Twice one are two,
Twice two are four,
Twice three are six.'

'What is that? Did you find no flowers with six petals? Twice three are six, you say. But had the flowers with six petals any green sepals? Now let us look.' She happened at the moment to be wearing a white lily which had been grown in the greenhouse, and this was carefully examined. There was no calyx, but there were six petals, three outer and three inner. There were six stamens in two sets, and the pistil was marked with three ridges or stigmas. All these points are well shown in our illustration (Fig. 47), and especially the petals in two sets.

Next came the snowdrop. It, too, was without a calyx, but the outer petals were large, and the inner ones had a notch with a pretty touch of green (Fig. 54). The squill and hyacinth were like the tulip. Then came the different kinds of narcissus, which one called jonquil, another daffodil, till Miss Flora reminded them that the word 'Narcissus' includes all the different species (Fig. 48). But here was a puzzle. It is true there were six petals, but ought they not to be called sepals? Was not the pretty tube in the centre the corolla? By taking several different kinds, such as we find in our illustration, the teacher showed them that the narcissus is at first like

FIG. 48A.—Drosophyllum.

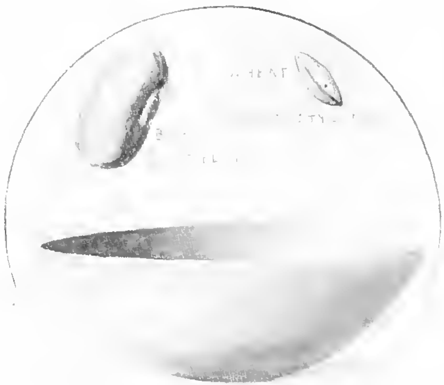

FIG. 49.—Bowl (or cotyledon), with Bean (or dicotyledon), and wheat (or monocotyledon).

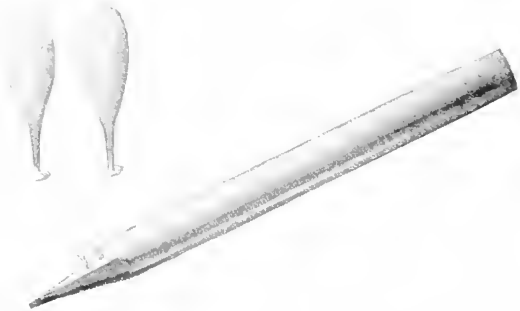

FIG. 50.—Pencil and pollinia from Orchis.

a tulip or hyacinth. It has six petals in two sets, which correspond to three sepals and three petals. As in the tulip, they are at first separate. They then begin to grow together, as in tne hyacinth. Then a little frill grows out from the combined petals, and the gardeners develop this, until the crown or corona is very large, and may be quite different in colour from the perianth.

When they came to sum up the results, the young people found that the flowers of Easter fell into two groups. One group, containing the wallflower, primrose (Fig. 72), and violet, had blossoms with distinct sepals and petals, which were four (in the wallflower and crucifers) or five in number. The other group had no distinct calyx, but the parts were in sets of three. It was soon found that these differences were attended by others. Nearly all the plants which had three parts were bulbous, and they all had thick leaves, spear-shaped, with the veins parallel. The other plants had net-veined leaves, and rarely had bulbs.

Miss Flora now asked them to compare the leaves of the narcissus and hyacinth with those of the grasses and cereals—wheat, barley, and rye. Though the leaves of grass were not so juicy, the shape was the same, and so were the veins. This led the teacher to point out that the tulip seed, like a grain of wheat, is a monocotyledon; while that of the wallflower and primrose is like a pea, which has two seed-lobes, and is therefore called a

dicotyledon. 'I am afraid I shall never remember those long words,' said Muriel. 'Let me try and help you,' said Flora. 'Here is John the gardener, he will find what I want.' Very soon John was able to obtain the things that were necessary. In his hands he had two little bowls, one of which was filled with beans, and the other with wheat (Fig. 49). 'Now for an object-lesson on monocotyledons and dicotyledons,' said Flora. 'If you take a bean and plant it, what will happen?' After a moment's thought Ralph shouted—'I know! It splits in two, and the root and stem grow out between the parts.' He was right. 'And now if you grow the wheat, will that split in two?' Another little pause, then Muriel answered, 'No!' Quite right again. 'I have two little bowls here. I will put them together. See! They resemble a bean, and each of the bowls is a cotyledon. You are learning Greek now. The word "cotyledon" means a bowl, cup, or vessel. A bean is called a dicotyledon because it looks like two cups or bowls placed side by side, and so the wheat is called a monocotyledon because it has only one seed-lobe.'

At the dinner-table that day the children became quite eloquent, for they were encouraged to talk about the things which interested them. They informed their mother that tulips and daffodils have their petals and stamens in sets of three, while in the crucifers they are in sets of four, and in violets and primroses in sets of

DAFFODILS.

five. Then they referred to the other marks which distinguished these plants, such as the bulbs and the leaves, and presently Muriel showed that she had quite mastered the hard words by explaining how Flora had illustrated the monocotyledon by means of the grain and bowl, and the dicotyledons with the bean and the two bowls. And so ended a very pleasant Easter pastime.

CHAPTER VIII

AMONG THE NOBILITY

I HAVE just been turning over my notes about the orchids. They have been growing and accumulating for a quarter of a century; and I have so much to say about them that I hardly know where to begin, and I am sure I shall not know when to end. The orchids need a volume all to themselves. But 'Do orchids grow wild in England?' some one inquires. 'We thought they were very rare plants, only to be found in foreign lands, and that they were so costly that a blossom was often worth a guinea, and every plant discovered cost a life.'

Of course the botanist smiles at this mixture of truth and error, but it is not my business to laugh at any one who has only a little knowledge of these things. I know only a little myself, but I should like to help those who wish to improve their knowledge. Let us observe, then, at the outset that orchids do grow wild in England, that there is probably not a single county where one or more may not be found, and that if we made a complete

FIG. 51.—Crocuses and Snowdrops.

FIG. 52.—Lady's Slipper, Snowdrops, and Acacia.

FIG. 53.—Primroses.

FIG. 54.—Snowdrops.

collection of British orchids we should find they numbered about fifty species or kinds. They are known by many different names. Those who glory in scientific terms called them goodyera, malaxis, epipactis, spiranthes, or cephalanthera. But people who love more homely terms speak of them as the butterfly orchis, the man, spider, or bee orchid, the lady's slipper, the musk orchis, or the frog orchid. Now, although the word 'orchid' is the more common, 'orchis' is the more correct form, for that is the true Greek name. But it is convenient to speak of orchids in the plural, so we shall employ both forms of the word, since use warrants us in so doing.

The popular names of the orchids are very suggestive, because they show what a variety of curious forms the flowers assume. Those which come from abroad are spoken of by such names as the zebra, the swan, the moth-hawk, and the bird of paradise. If our native plants have not the large, showy, highly coloured, richly perfumed, and curiously formed blossoms of the East, there is not one of them which does not merit the most careful study, from the common tway-blade to the striking lady's slipper (Fig. 52). They are all either fragrant or fantastic. The rule is that the simplest are the most fragrant, while those whose blossoms are the most curious lack the sweetness of their more modest rivals. The reason for this is not far to seek.

It has been often pointed out that it is not easy

for the plants to keep up a lavish outlay. If they have glowing colours, and flaunt their curious petals in the breeze, like the banners of a victorious army, they can seldom find the means at the same time to produce fragrant perfumes and alluring nectars.

So exactly do many of the orchids imitate various kinds of insects or birds that it is at times impossible to distinguish the one from the other. A friend of mine, residing in Australia, used to tell me how, when she was a novice at botany, she often swept the butterflies into her net, only to find that they were orchids; and I have often known the bee and fly orchis in England mistaken for the insects they so closely resemble.

This resemblance is generally called mimicry, and the subject of plant mimics has of late years been carefully studied by some of our ablest botanists. All who are interested in orchids are aware that the famous Darwin wrote a book on the subject of their fertilization. Some years ago a gentleman sent me a bee which he had captured. It had a pair of curious horns on its head, and the gentleman wanted me to tell him if it was some kind of disease. I looked at it with my pocket lens, and burst into a hearty laugh. Returning the bee to the collector, I said it was suffering from what is called the fertilization of orchids. The explanation was simple. The bee had visited one of the common English orchids in search of honey. In so

FIG. 55.—Foreign Orchid (*Cattleya*).

FIG. 56.—Lady's Slipper, with Snowdrops.

doing, its head had come into contact with a sticky mass in the centre of the flower, and a pair of pygmy Indian clubs, known to botanists as the pollinia or pollen masses, had come away. As the bee flew elsewhere, these clubs remained attached to its forehead. It had been caught on its way to visit another flower, where it would have left its precious burden behind, and so fertilized an orchid. These club-shaped bodies contain the pollen grains, and must be transported by some means from one flower to another (Fig. 58).

Any one can carry out the experiment for himself, and those who do so successfully will not soon forget the pleasure which it affords. Take a common lead pencil, neatly sharpened to a point, and insert it carefully into a flower of the early purple orchis. Give a slight twist or movement to the pencil and then withdraw it. Perhaps the first attempt may be a failure, but after a time it will be found that a pair of pollinia have been secured, and are attached very firmly to the point of the pencil (Fig. 50). Now set yourselves the task of finding out how it is that the clubs droop when they are removed, and why this drooping is necessary. It is a pleasing study, and it is better that you should work it out for yourselves than that I should tell you everything.

Our native orchids may usually be known by their glossy leaves, juicy stems, and curiously shaped flowers.

They nearly all turn black when they are pressed and dried, which is a great disappointment, for the collector likes to see his flowers retain the freshness and beauty of youth. It is well, therefore, to pick some of the flowers from a stem, and press them separately with special care. In this way they may often be made to keep their colours and shapes much better than when pressed in the ordinary way.

The lady's slipper is the largest of our native orchids, but it cannot now be found by the young botanist, because, like many other rare plants, it has been almost exterminated. We must therefore be content to admire it in pictures, or through the medium of those foreign species which are now so freely cultivated in our greenhouses. The botanical name is Cypripedium, and I will tell you why; for I want you to learn the meanings of our plant names. Away to the east of the Mediterranean is an island called Cyprus. Here large quantities of metal are found, and this metal is made into pennies. It is called copper, or the metal from Cyprus. Now the people of Cyprus were greatly devoted to Venus, the goddess of Love, so she came to be called Cypris. Thus our plant Cypripedium has something to do with Venus. But what is the second part of the name? It reminds us of pedal and biped, and evidently stands in some connexion with the foot. Now the flower of this

FIG. 57.—Butterfly Orchis (*Habenaria*).

FIG. 58.—Fertilization of Orchids by bees.

kind of orchid is similar to a shoe or slipper, and that is the meaning of pedium, so the name means Venus-slipper. But when Christianity took the place of the old religion, the Virgin Mary, or 'Our Lady,' was put in the stead of Venus, and so we get lady's slipper (Fig. 56).

Perhaps the commonest form of English orchid is the tway-blade, and the name is intended to teach us that the plant has only two leaves. These are rather large, ovate, and placed opposite each other, while the stalk of greenish flowers grows up between them. Though by no means a pretty flower, it is one of the most remarkable of the whole order, as you may learn by reading what Darwin has to say about it, and by examining it carefully with your pocket lens. The most fragrant of our English orchids are the Habenarias, which include the butterfly orchis (Fig. 57), and the aromatic orchis.

That the supposed similarity between the flowers and certain insects is not the result of the recent development of the imagination may be clearly seen from the fact that two hundred and fifty years ago or more the famous old Gerarde wrote of them as follows: 'There be divers kindes of Fox-stones, differing very much in shape of their leaves, as also in floures: some have floures wherein is to be seene the shape of sundry sorts of living creatures; some the shape and

proportion of flies, in other gnats, some humble-bees, others like unto honey-bees; some like butterflies, and others like wasps that be dead; some yellow of colour, others white, some purple mixed with red, others of a broune overworne colour; the which severally to distinguish would require a particular volume.' It would be interesting to know how far the following records of the same writer hold good to-day: 'The Bee, the Fly, and the Butterfly Satyrions do grow upon barren chalkie hills and heathie grounds, upon the hills adjoining to a village in Kent named Greenhithe, upon long field downes by Southfleet, two miles from the same place, and in many other places in Kent; likewise in a field adjoyning to a small grove of trees, half a mile from Saint Albons, at the south end thereof. They grow likewise at Hatfield, neere Saint Albons, by the relation of a learned preacher there dwelling, Mr. Robert Abot, an excellent and diligent herbarist. That kind which resembleth the white butterfly groweth upon the declining of the hill at the north end of Hampstead Heath, neere unto a small cottage there in the wayside, as ye go from London to Hendon, a village thereby. It groweth in the fields adjoyning to the pound or pinnefold without the gate, at the village called High-gate, neere London; and likewise in the wood belonging to a Worshipfull Gentleman of Kent named Master Sidley, of Southfleet.'

FIG. 59.—Foreign Orchis.

FIG. 60.—Vanilla.

That the fantastic shapes and adornments of the different species of orchid serve a useful purpose no one can doubt. If all the mysteries connected with their life-history have not yet been cleared up, we still know that many of the curious processes associated with the blossoms are special adaptations for purposes of cross fertilization. The marks of the Zebra orchis, the horn-like petals of Dendrobium, the bird-like blossoms of the Snipe orchis and of the dove-plant cannot be mere accidents, any more than are the bee-shaped blossoms of our more common species. Their infinite variety precludes the idea that they have been evolved by freak, accident, or chance. To the devout mind they supply (despite the modern scorn) a pleasing suggestiveness of design, and lead us to regard them as among the most wonderful evidences which our native plants supply of the operation of law. The existence of a master mind, which is beautifully operative in nature, is surely suggested by their study, and on this ground we would direct to them our special attention (Figs. 55, 59).

Many wonderful things remain to be learned about this noble family of plants. I can only hint at a few. Though nearly all the plants are fragrant, the perfume of at least one species is poisonous. There is a black sheep in every flock. But over against this we must set the fact that there is an orchid which is used for the

manufacture of perfumed tea, the fragrance of which long remains in the mouth. It is as nice cold as hot, and the plant which is used produces white flowers. It grows as a parasite, or rather epiphyte, in the forest of Mauritius, and is called *Angraecum fragrans.* You may see the plant growing during the proper season at Kew, where many other wonderful orchids are to be seen. Many orchids grow on trees, and this accounts for the name Dendrobium. Some of our orchid growers send their agents all over the world to find these wonderful plants, and one of the travellers tells us that in Madagascar he once sought long for a gorgeous flower which he knew to be growing there. But when he found it, there was a tiger on guard! It seems that the favourite haunt of the animal was among the masses of foliage in which the orchis grew. One is reminded of the legend of the guarded treasure.

We are told that a gentleman once found an orchid in a swamp. He went to get the prize, was seized with malaria, and sacrificed his life for a flower. The people in some lands decorate their temples and churches with orchids, and in Ceylon there is a form which bears the name of the Dove-plant, because you can see, inside the blossom, the representation of a dove with the wings spread out. It is thirty years since I first saw this lovely orchid in the Far East, and I have never forgotten it. The Spanish name for it is Il Spirito Santo, or the Holy Ghost flower.

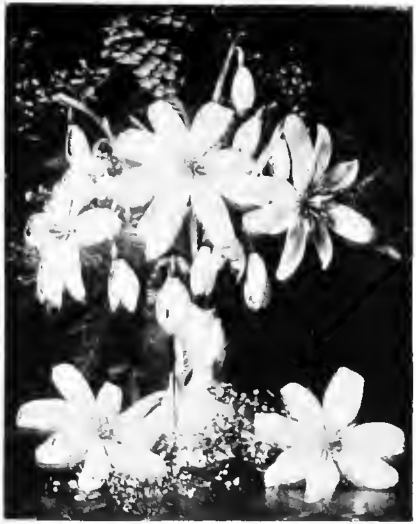

FIG. 61.—Virgin's Bower and Snowdrops.

FIG. 62.—Giant Bellflower, or Campanula.

FIG. 63.—Garden Clematis.

Though the orchids are chiefly remarkable for their beauty or their novelty, a few of them possess valuable properties, and I may mention that vanilla (Fig. 60), is produced from one group, and salep from another. It is like reading a romance when one begins to trace the way in which the clever chemist and the devoted botanist have made these discoveries, and such a study may well lead you to long for the time when you will be able to add some new fact to the knowledge we already possess.

CHAPTER IX

THE TWO BLUEBELLS

THIS chapter is for those clever little people who can catch the first day of summer kissing the last of spring. For it is only then that the two bluebells meet. It is true we can find delightful forms of each in the greenhouse almost all the year round, and this will enable us to study all the points carefully at our leisure; but those who would find the two bluebells growing near each other will have to be wide-awake. For the first comes in the early spring, and clothes the woodland with turquoise and emerald before the foliage is fairly on the trees; while the second does not care to put in an appearance until it can wash its face in May dew, and take frequent sun-baths on the open moor. The former begins to carpet the land with its succulent green foliage as early as March, while the latter is not usually in flower till July. But some fine day in June, as we peer among the lingering blooms of spring, we may still be so lucky as to find a solitary hyacinth, while among the forerunners of summer we shall very likely descry a pretty campanula waving its delicately poised blossom in the

FIG. 64.—Hyacinth.

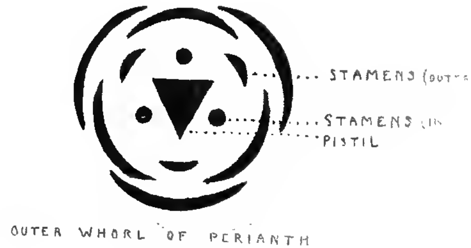

FIG. 65.—Diagram of Monocotyledon.

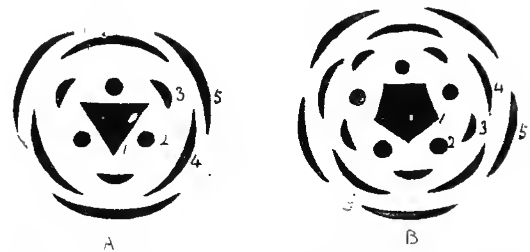

FIG. 66.—Diagram of Mono- and Dicotyledon. A, Monocotyledon; B, Dicotyledon. 1. Pistil; 2. Inner whorl of stamens; 3. Outer whorl; 4. Petals; 5. Calyx. The perianth is made up of 4 and 5.

breeze. These are the two flowers we want to bring together, first to show in what they resemble each other, then to see how widely they differ. That is how botany is made easy and delightful.

As the hyacinth comes first, and we have a long time in which to study it before the bluebell campanula appears, we begin with it. Cultivated forms will be in blossom in the house or garden very early in the year, and we shall presently have something to say about this early appearance (Fig. 64). For the present we will be content to leave roots, bulbs, leaves, and stems unnoticed, and turn at once to the flower. You observe that it is, as its name bluebell indicates, somewhat bell-shaped, and is made up of six parts, which are joined together at the base or claw. Those who have studied the former chapters carefully will know what to make of the absence of a calyx, and will call the flower a perianth. The true, essential part of the flower is in the centre, and consists of ovary, pistil, and stamens. The first half of the word perianth suggests something which lies around (*perianth:* from two Greek words, *peri*, around, and *anthos*, a flower), and so the perianth is simply that which surrounds the central part of the flower, the blossom. The six parts may be regarded as two sets of three. The outer set is the counterpart of a calyx, and the inner set represents the corolla. If you look at a diagram of a flower you will see how this is (Fig. 65). In the centre is the

pistil, represented by a triangle to show its triple form. Next to the triangle are three dots, forming the inner whorl of stamens. Opposite the angles are three other dots or dashes, forming the outer ring of stamens. Then over against the inner set of stamens are three lines representing the petals, and opposite the angles of the pistil are lines which correspond with the positions of the sepals. It is a good thing to study this arrangement carefully, because when we get farther advanced we may sometimes be puzzled to know what part is wanting in a given flower, and then this diagram may help us. If Nature seems sometimes to leap all bounds, she invariably leaves traces behind, and by their aid we can still follow her movements.

We find, then, that the hyacinth has a bell-shaped flower, the perianth of which is composed of six parts, three sepals and three petals. The blossom is usually blue, but blue flowers frequently become white, and sometimes pink, so it is easy to produce pink, white, or blue flowers from hyacinths and campanulas.

Now let us look for the summer flower. The large campanula will be found in the same wood or copse which yields the hyacinth, and a handsome plant it is (Fig. 62). While we have only one species of hyacinth, we have several campanulas in our flora. They include the hair-bell, bluebells of Scotland or Canterbury bells, rampions, giant bell-flower, nettle-leaved bell-flower, and others.

CYCLAMEN.

The flower is more truly campanulate or bell-shaped than the hyacinth is, but in each case the petals have grown together, and the pistils seem to be joined. Any one who did not know botany would be led to say, 'Surely they are closely related!' Yet a little examination shows that they are wide as the poles apart. Here is the value of botany. It saves us from confusing plants which resemble each other in some particular. The deadly nightshade has a fruit like a cherry, and the child mistakes the one for the other, and is poisoned. The labiate has a leaf like a nettle, but no botanist ever mistakes the one for the other. If he handles the first without being stung he is not foolish enough to touch the other because it looks so harmless. We must beware of superficial resemblances.

We will examine our hairbell as we did our hyacinth. The flower is tubular, but you observe that it has five parts. Now, sets of five belong to dicotyledons, but sets of three to monocotyledons, as our earlier lessons have taught us. Tulip, crocus, snowdrop, daffodil, all have their parts in triplets. Primroses, buttercups, daisies, roses, have their parts in fives. Our hairbell resembles a primrose and daisy, so it belongs to the dicotyledons. The leaves and other things tell us this, and the flower confirms it. If we look outside the blue corolla we shall find that there is a green calyx, whereas the hyacinth had none. When a plant like the narcissus or tulip has

its blossom made up of six coloured parts we call it a perianth ; but the bell of the campanula is a true corolla, and the sepals are not run into the blossom, but remain separate to form a true calyx. Now if we put all this again in the form of a diagram, and place our first diagram by its side, we shall at once see the difference (Fig. 66).

There is one weakness about the diagram. It does not show the joining of the parts to form the perianth in the bluebell or the corolla in the campanula, but that is remedied in the other illustrations. Note that some dicotyledons have only one ring or set of stamens. Our diagram represents a plant with two sets.

It now remains for us to look a little more closely at some striking differences between the two plants. In spite of what appears to be a remarkable resemblance, the likeness is very superficial. We have blue colour and a bell-shaped blossom, and so we call them both bluebells, but there the similarity ends, and for the rest they might have grown in different worlds. The hyacinth comes in spring, it has fleshy, juicy leaves and stalks, it grows in shady woodlands, it produces seeds, but it also manufactures bulbs. Its aroma is noteworthy, and when the plant is cultivated the fragrance is most delicious, becoming almost too rich for the room in which it is grown. The campanula comes in midsummer, its leaves are thin, its texture is flimsy, it grows no bulb, it has little fragrance ; yet it is a favourite

Fig. 67.—Lady's Smock (*Cardamine pratensis*).

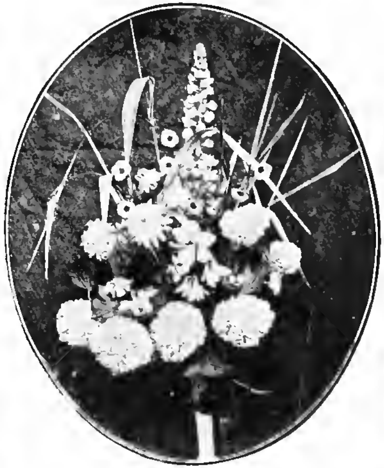

Fig. 68.—Flowers of Our Lady.

Fig. 69.—Sweet Peas.

with the gardener, and one or other of its many forms, from the pretty creeper found in our bogs in Devon and Wales, and known as the ivy-leaved bell-flower (*Wahlenbergia*), to the giant forms with spray and cluster found both at home and abroad, are always in request.

When we come to look for the reason of things we find that the hyacinth is a member of that family which believes in domestic economy. 'Always keep a shilling in your pocket, and you will never be without money' is its motto. A humorous writer has told us some of the advantages of having a five-pound note always with us, and many of us would like to try its virtue! Well, the hyacinth does not believe in spending its last penny, and that is why it can come out so strong in spring.

Here are two seeds. One is that of the hairbell (*Campanula*), the other that of the bluebell (*Hyacinth*). The campanula seed is like the little boy who says, 'I want to be a man,' so it rushes through life in a season. It sprouts in May, blossoms in June, marries in July, brings up its family in August, and—— what wonder if it dies in September?

The hyacinth says, 'I see no need to be in such a hurry. I hold it to be good economy to get before you spend.' So the seed sprouts, sends out leaves, feeds long on the air and the soil, stores up material, and without attempting to produce a flower makes a treasure-house underground, and packs it with valuable stuff. During

the winter the bulb lies dormant, but as soon as the warmth of spring begins to make itself felt, the bulb awakes, takes time by the forelock, sends out its splendid flowerstalk, and enjoys the sweet days of the early year. When the flower has had its turn, the leaves set to work to lay aside another store. They have all the summer before them, and just as other plants are beginning to awake to duty, they are reaping a golden harvest, and getting ready for another year. How different the methods of the two plants! Which is the wiser? It is a curious fact that nearly all our campanulas are now perennials like the hyacinth. They have learned that the wild-goose chase is too risky. It does not tend to nobility. It is only the poorest and commonest blue-bells that now adopt the habit of growing up, flowering, and ripening their seeds all in a year. They follow the more stately method of the hyacinth, and have cast off the annual for the perennial.

This little study has taught us many things about the wild and cultivated flowers, and lest we should forget them I will ask you to run over the main lessons again in a slightly different order. Flowers which seem to resemble each other may in reality be widely separated. We must not be misled by superficial resemblances, but go further and study the differences; for what looks like a cherry may be a deadly poison. The adage says 'All is not gold that glitters,' and appearances are deceptive.

FIG. 70.—Lady's Slipper.

FIG. 71.—Anemone.

The best plants study economy, and do not spend before they get. They lay up stores of material during the summer that they may be ready to begin housekeeping in the early spring, and so take time by the forelock. The bulbous plants are therefore always among the earliest to appear, because they have large supplies of valuable material from which to draw; just as a rich man can draw his money from the bank. The hyacinth is a monocotyledon; it has the parts of its flowers arranged in sets of three, and the petals together with the sepals form the perianth, while the leaves are parallel-veined, and a bulb is formed one year to support the plant during the next season. The campanula is a dicotyledon. It has a separate calyx and corolla, and its parts are in fives. The leaves are net-veined, and there is no bulb.

Let me add one word respecting the names in common use for the campanula. In this chapter I have spoken of the hairbell, but presently you will read of the harebell. I have purposely used both terms, because they will both be found in the books you will read in the days to come. The term 'hairbell' refers to the delicate stalk on which the bell is suspended. But the form 'harebell' is more ancient and correct. Like the words 'foxglove' and 'cowslip,' it was given in the days when our forefathers were very fond of animals; and each of these names may contain a meaning to which we have lost the clue.

CHAPTER X

THE FLOWERS OF MARY

I THINK if you will go out with me to-day into the garden and recline in the Virgin's Bower (Fig. 61), and then go into the country, and learn all you can about the flowers which have been dedicated to the Virgin, it will afford you a great deal of pleasure. It was a pretty idea of our forefathers to dedicate their choicest flowers to the saints. In heathen lands the custom has existed from the earliest times of naming the most conspicuous flowers after the hero or the demigod. Buddha and Thor, Freya and St. John have, in this way, come in for a due share of recognition. To none, however, has greater honour been shown than to Our Ladye—the Virgin Mary. Her garland is as large as it is varied. Almost every order of plants known to Europeans, and possessed of any feature of note, has been laid under tribute to supply her with a worthy wreath or posy. As the plants which bear her name, both among the peasants and those of scientific tastes, may be found during every season of the year, we may take up this interesting study either in

FIG. 72.—Primrose (*Primula vulgaris*).

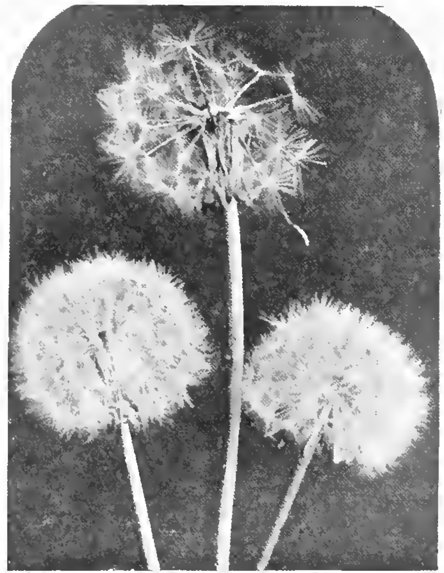

FIG. 73.—Dandelion in fruit.

spring or autumn, in summer or winter. The snow drop is often in flower in January, and from the time that its innocent blossoms appear right away to December the succession never ceases.

In the olden days the second of February was known as the Feast of the Purification of the Virgin Mary. On that day the custom was for girls to dress in white and walk in procession. Hence the snowdrop, which was then flourishing in snowy whiteness, was called Fair Maids of February and Procession Flower. This pretty bloom (Fig. 54) is related to the lily tribe. Its parts are arranged in sets of three, and this, you will remember, is one of the marks of the monocotyledons. It is interesting to observe the way in which the young plant forces its tender leaves through the soil in winter, and beautiful to notice how the young blossom, presently to droop like an eardrop, is held upright between the leaves, in such a way as to secure for it the easiest passage into life.

In the hedgerows, one of the earliest plants bearing the Virgin's name is the crosswort or bedstraw. Its leaves are arranged in whorls on the stems, four in a whorl, suggesting the form of a cross, in a way similar to that which we find in the petals of the wallflower and other crucifers (see p. 243). Notice these cross-like forms, for they will help you to remember the plants another time, when they come up for fuller study.

How came this plant to be dedicated to Mary?

There is a pretty answer to this question. When the Holy Mother went to Bethlehem there was no room in the inn, so she had to place the infant Jesus in a manger. Among the plants which formed His first bed (the legend says) the crosswort found a place. For this reason it was named the lady's bedstraw. If some one objects to such Popish nonsense, we must reply that people were not always able to read and write as we do, nor had they so many amusements, pastimes, or aids to a happy life, and we must not grudge them these innocent traditions.

I remember when I was a little child how greatly I was delighted one spring to find rich clusters of the lady's smock. Its pink or lilac blooms, waving in the gentle breeze, are said to resemble garments which have been hung out to dry and bleach, after passing through the washtub. Cuckoo-flower is another name for this plant (which the botanist calls *Cardamine pratensis*, Fig. 67), and in Lakeland it is often called lambflower. In each case the name refers to the fact that the plant appears at the same time as the cuckoo or the lamb. Hear what Shakespeare sings :

> When daisies pied, and violets blue,
> And lady smocks all silver white,
> And cuckoo buds of yellow hue
> Do paint the meadows with delight,
> The cuckoo then on every tree
> Mocks married men, for thus sings he :
> Cuckoo !
> Cuckoo, cuckoo : O word of fear,
> Unpleasing to a married ear !

FIG. 75.—Strawberry, calyx and fruit.

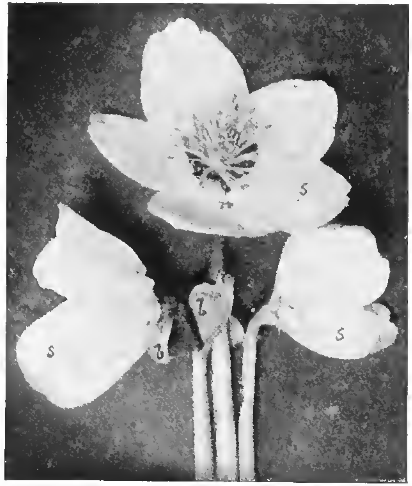

FIG. 76.—Hellebore, (*b*) bracts, (*s*) sepals, and (*n*) nectaries.

FIG. 77.—Indian Strawberry, with sepals (*s*), and calicula (*c*).

I have a great liking for the names which have been given to our common plants by the rustic folk, for these homely people always have some reason for their choice, and the names often have associations with everyday events which may be recalled with pleasure. I may, perhaps, add a few words respecting the smock which will illustrate this.

Smock was the old name for an undergarment worn by women, and was so called because it was crept into, or pulled over the head. We now dignify the garment with a name derived from our French neighbours, but in Sussex a smock is still worn by the men in the shape of a round 'frock' or slop. Lady Mary W. Montagu, describing her Turkish dress, says that her smock was of fine white silk gauze, closed at the neck with a diamond button, but the shape and colour of the bosom was very well to be distinguished through it. This under garment of the Virgin, miraculously preserved, was in former ages regarded as the most efficacious weapon that could be employed against the heathen worshippers of Odin. When, for example, the inhabitants of Chartres, in 911, gained a somewhat dubious victory over Rollo, they ascribed it to the wonder-working properties of a chemise, 'which had long been the chief object of veneration in their cathedral, and which they had borne before them, suspended on a lance like a banner.' The Byzantines were wont to protect

themselves in a similar way from the hardy sea rovers of the ninth century, their priests carrying the garment in solemn procession, and dipping it in the sea, in order that the waves (we suppose) might aid them.

The lady's smock is a crucifer, i.e. the petals are four, arranged crosswise. To this large order belong the wallflower, turnip, cabbage, mustard, cress, and many other plants, both wild and cultivated. There are six stamens, four long and two short, and as there are several different kinds of seed-vessels it is useful to study these, because the plants can then be separated into smaller groups, which makes it easier to master them.

Like the crosswort, the lady's mantle has very modest yellowish blossoms. It is more interesting to the botanist than to those who only care for beautiful flowers. Perhaps it is one of the plants which have not been able to keep up to their former standard; for plants, like families, sometimes degenerate. It belongs to the rose family, and we are well aware that in this order many of the plants are very dignified. The principal charm of the lady's mantle lies in its leaves. Their shape is exceedingly graceful, and reminds us of the mantillas worn years ago by the old-fashioned folk. When you visit the mountains you will find the Alpine lady's mantle, and I think you will agree that the little plant is full of interest. Its leaves are covered with hairs,

FIG. 78.—Hips.

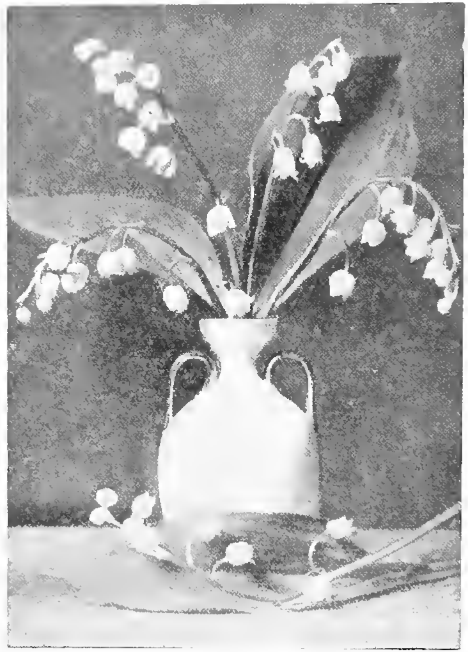

FIG. 79.—Lily of Valley.

which give it a silvery hue, and you will do well to ask yourselves, or your friends, what useful end they serve.

Every child is familiar with the lovely little flowers known as shoes and stockings, boots and shoes, fingers and thumbs, butter and eggs, or crowfeet. This plant (called *Lotus corniculatus* by botanists) belongs to the same family as supplies us with peas and beans, clover and trefoil, broom and gorse. It is a leguminous plant, and its structure is very wonderful. When a bee settles on the blossom the anthers dust it on the underside with pollen. Then when it reaches a flower whose pistil is ready to receive this valuable dust, the pollen is left behind, and the plant is fertilized. All this you will be able to study in other books as your knowledge of botany advances. This plant is sometimes known as Our Lady's Cushion.

As the Virgin was poor she was not supposed to have a sewing-maid. So she must know how to ply the needle and wear the thimble. To supply this necessary article the foxglove (Fig. 23), or the Canterbury bells (Fig. 14), were laid under tribute, and the idea is a very pretty one. We have other allusions to these plants elsewhere, so I will only remark here that the foxglove is nearly related to the speedwell, while the Canterbury bells are known as campanulas, because their flowers are bell-shaped.

I hope to tell you in another chapter the story of the pinchweed, but we must not forget, when we are making

up our collection of plants belonging to the Virgin, to give the persicaria a place. We must add a nightcap in the shape of the convolvulus bloom, and ribbons or garters will be found in the striped grass which is often put into the posy in country places (Fig. 68).

A little incident is on record in the life of Dalton, the famous chemist, respecting the lady's slipper. Dalton often used to say he had no time to marry. He had not, however, always been indifferent to the charms of the fair. When Sir Henry Roscoe was looking through the collection of plants which Dalton had made, he came across a dried specimen of the lady's slipper (*Cypripedium calceolus*, Fig. 70), a charming orchid which was formerly abundant in Yorkshire, but is now almost extinct. Under the specimen in the handwriting of Dalton were the words, 'Presented to me by Nancy Wilson, of Thornton-in-Craven.' Miss Johns, who was exceedingly intimate with the great chemist, relates how the said Nancy had touched his heart's core. 'He used to mention with the warmest interest, and with deep sensibility, a most amiable and accomplished Quaker friend, who died young. He had a letter and some verses of this lady's, with which we could by no means prevail on him to part, or even to let us look at, though he read them to us with a faltering voice, and what was very rare with him, with eyes suffused with tears, repeating as he ended, "Poor Nancy, poor Nancy."'

FIG. 80.—Hellebore, with stamens removed to show (*c*) calyx, (*cr*) carpels, and (*n*) nectaries.

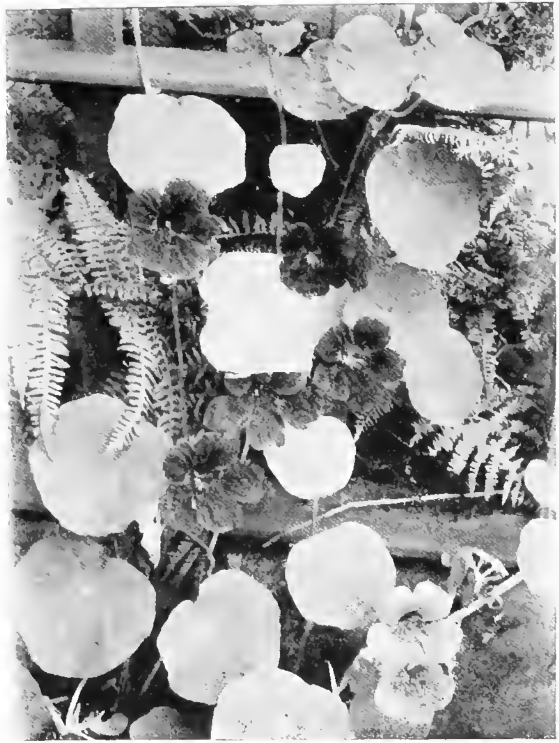

FIG. 81.—Nasturtium.

Thus may a simple flower be suggestive of many old associations.

Our list is far from being exhausted, and if I had named all the plants which bear the Virgin's name in England, there would still be many others which are found abroad. It is, however, unnecessary to exhaust the subject, and if any readers wish to follow it out more fully they may turn to the different books which deal with plant-legends, or to my own *Flowers and Flower-Lore*, where a long chapter is devoted to the flowers of the Virgin.

CHAPTER XI

THE EMERALD CHALICE

Hark! hark! the lark at Heaven's gate sings,
  And Phoebus 'gins arise
His steeds to water at those springs
  On chaliced flowers that lies.

IN spite of Shakespeare's bad grammar we are grateful to him for this pretty fancy. The sun is watering his horses at the flower-fountains. The chalice is the calyx, and the two words are closely related. But while the chalice is a cup out of which we may drink our nectar, the calyx is something which covers up a delicate blossom and keeps it from harm. No one can really understand the mystery and beauty of flower-lore who has not made himself master of the calyx, studied the many forms it assumes, and reflected on the endless uses to which it is applied.

We shall therefore spend a little time over the chalice or calyx, first tracing its origin and shapes, and then looking at a few of its uses. It may surprise you if I say that the calyx was at one time only a leaf, or a number of leaves, with the same shape and colour as the

other leaves of the plant to which it belonged. But if we look at the different kinds of leaves on many of our native plants, and then look at the many different kinds of calyces which these plants bear, we shall see that the idea is a very natural one. The calyx is still, in a great many cases, only a whorl of leaves, and if you were to pluck these leaves, or sepals as they are called, and compare them with the leaves which grow on the same branch or flower-stem, it would be impossible to distinguish sepal from bract, and bract or sepal from leaf, so exactly alike are they.

When the beautiful blossoms reached their delicate perfection, and the stamens were producing their wonderful pollen, it was necessary to give them shelter. There were many enemies to be guarded against. The frost and snow, the wind and rain, the snail and insect were only a few of these natural foes. So some of the leaves said, 'We will be the Queen's bodyguard, and protect the fairy blossom and her golden treasure from harm.' That was the origin of the calyx. Hence its first duty is to cover up the young bud, and give it time to develop before opening its petals and shedding its pollen-grains. The green parts of plants are usually the hardiest, and the calyx remains green in many flowers in order that it may retain its vigour.

But as the flowers advanced and became more and more varied, the calyx had to take on new duties. To

do this it must be ready to alter its shape and even its colour. So while the calyx of the buttercup is made up of a few green sepals, each separate and distinct, the calyx of the primrose is a real calyx or cup, made up of five sepals joined together. The ends are still free, to show that the sepals were once only green leaves; and if next April you will examine the primrose beds carefully you will very likely find a freak or sport, in which the calyx has been changed back into its five green leaves.

Now, in the primrose the calyx has not only to protect the bud before the flower opens, but when the lovely blossom is inviting the insects to a feast the calyx has to support the tube of the flower, which would otherwise be too weak for its task (Fig. 72). Whenever we find a calyx which has grown into a true chalice like this, we may be pretty certain that the flower is visited by insects which come to drink the nectar or flower-wine, and then carry away with them the golden pollen by which the flowers are fertilized.

Now let us look at another wonderful way in which the calyx has been changed and set apart for a new and beautiful use. I told you in the story of the daisy that the part which looks like a calyx is called an involucre. The true calyx in the composite flowers must be looked for elsewhere. And the best way to see the calyx here is to pluck a dandelion when the flowers have withered, and a ball of silvery threads, delicate as a spider's web,

FIG. 82.—Tobacco plant (*Nicotiana*).

FIG. 83.—Columbine (*Aquilegia*).

covers the head. There is the involucre, which did duty for the true calyx when the blossom was growing and unfolding; but now we see a very wonderful sight. Each seed has a long stalk rising from its crown, and on this stalk are a number of delicate hairs (Fig. 73). You have blown at these a thousand times when you wanted to know what o'clock it was! Those hairs, which form a parachute, and carry the seed into the air, are nothing less than the calyx. Could you have dreamed of putting the green leaves of a dandelion to so marvellous a use? M. Santos-Dumont and Sir Hiram Maxim would be devoutly thankful if they could do anything so clever.

In the case of the dandelion the calyx is above the seed, while in the primrose it is beneath it. Here, then, is a very good point at which to study the difference between a calyx inferior and a calyx superior. At school some boys are in upper and some are in lower classes. Some girls are always at the top of their class and others are always lower down. So it is with the chalices of the flowers. Take an apple and look for its calyx. Though the apple is ripe, and the flower has long since disappeared, the remains of the calyx may still be found at the top. Or look for the calyx of the strawberry (Fig. 75), and you will find it beneath the fruit. The apple and the strawberry are both nearly related to the rose, but one has an inferior and the other a superior calyx (Fig. 78). That may not seem to be very interesting or very important,

but it is by the study of such points as these that we become in time masters of the science of botany. In the olden days, people had to learn these things without their being made interesting. But the study of botany to-day is like taking a powder: we mix it with plenty of jam!

As it would require a volume as large as this to tell you all about our emerald chalice, I must be content to pick out a fact here and there, and ask you to add to this chapter from time to time as your knowledge of the calyx increases. So we will now notice that the sepals, which are usually green, are in some plants changed both in shape and colour to make them look like petals (Fig. 71). I cannot here explain how it is we know the calyx when it has so changed in colour and appearance. You must take my word for it till you are able to study botany more thoroughly. But I can give you illustrations of what I mean. Here, for example, is the Christmas rose (Fig. 76). Where are the petals? And which is the calyx? No! you are mistaken. Those small green nectaries (*n*) or chalices in the bottom of the flower are the true petals. These which look like petals are really sepals (*s*), and the calyx has been changed into a corolla. When sepals look like petals we call them petaloid, and the winter rose has a petaloid calyx, or its chalice has been converted into a blossom that the petals may form nectaries. In Fig. 76, *b* marks the bracts.

AUTUMN ANEMONE.

If the flowers reason, and have a language, what delightful times they must have when they are talking over their plans! Fathers and mothers often sit around the fire when you are snug in bed, and lay plans for your future. They do not intend that you shall just follow in their footsteps in everything. So in time families change, and when you read their history you are surprised at the progress they have made. The history of the flowers is just as surprising. Sepals change in shape and colour till they became petaloid, and are mistaken for corollas, as in the anemone (Figs. 71, 74). Petals also change, and in the case of the hellebore, which is the name by which botanists know the Christmas rose, they are converted into green nectaries (see p. 164).

Sometimes we have what may be called a false calyx or calicula (Fig. 77). I must not attempt to describe the various forms, but it is necessary to refer to the fact, so that when you see a flower which is not so simple as the rose or harebell, you may not be too much puzzled. If you look at a strawberry you will see what I mean. In the Indian strawberry (*Fragaria indica*, Andr.) the calicula looks like a true calyx, and the real sepals (*s*) are very insignificant. Here the bracts have been modified.

The cup in which the acorn grows might be called a calyx, but it is necessary to have a different name for such a special form of chalice, and so we call it a cupula or little cup, corresponding with calicula or little calyx.

Every one knows the brilliant poppy of the cornfields. If you examine a number of these flowers when full-blown you will wonder which part is the calyx. No such organ is to be found, for in the case of the scarlet poppy it falls to the ground when the petals burst their sheath. Here the calyx has completed its task when it has safely brought the blossoms to perfection. Hence the calyx is called caducous. How different is this from the calyx of the mulberry, for example! In this tree the calyx changes into a fleshy substance, and so becomes a fruit. Although our common roses adopt a somewhat different plan, the scarlet hips which adorn our hedgerows in autumn may be looked upon as coral cups made by the increase and thickening of the calyx.

Very different from these is the beautiful chalice which is often found in vases in winter, when flowers are rare. This is the calyx of the winter cherry (*Physalis Alkekengi*, L.), a plant which is very nearly related to the potato, and to the bittersweet of our hedgerows.

If you are at all curious about flowers, and in the habit of asking questions, I have no doubt you have often inquired where the calyx of the tulip and lily, crocus and daffodil, is to be found. Perhaps you have examined the narcissus, and have come to the conclusion that the papery substance found beneath the flower is the calyx. But the tulip has not even this pretence at a chalice.

All these plants belong to the monocotyledons, and if

FIG. 84.—White Water-lily (*Nymphaea alba*).

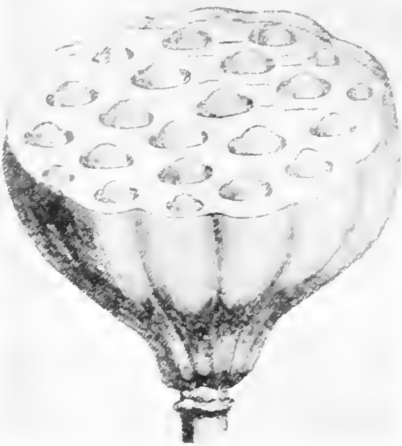

FIG. 85.—Fruit of Lotus (*Nelumbium*).

FIG. 86.—Foreign Fleabane (*Cineraria*).

you will look carefully at them you will find that the parts are arranged (as I have already explained) in sets of three. The pistil in the centre is three-cornered, or has three heads, or can be shown to have three chambers at the base or ovary if we cut it open. Then there are six stamens in two sets of three, and six petals also in two sets. This form of flower we call a perianth. It is really made up of calyx and corolla combined. The three innermost petals are the corolla, the three outermost are sepals. They have, in many monocotyledons, all the same colour, and in some cases have grown together, just as the petals of the primrose have done, so as to form a bell, as in the lily of the valley.

In some cases this tendency to combination has resulted in a further beautiful modification, which the gardener has turned to good account. Look again at the daffodil, jonquil, or narcissus (Fig. 48). These are all names for one and the same kind of plant. The botanical name *Narcissus*, with which a pretty Greek legend is associated, covers all the different species. The various kinds may be known as daffodil, lent-lily, butter and eggs, jonquil, or any other name you please. They have no separate calyx, but the flowers are usually formed into a trumpet. Six coloured leaves are often found surrounding a curious tube, which may be very short and edged with crimson, or very long, as in many of the larger daffodils. This tube is called the crown or corona, and

really takes the place of the corolla of the primrose, while the other portion of the flower makes a kind of calyx. Do you not think all this very delightful? It shows how ingenious Nature is, how cleverly she can throw off the old fetters and chains, and yet how in the end she realizes that there are limits to her powers of change, so that she comes back to the best again in the end.

Here we must bring our study of the emerald chalice to a close, although we have only been able to look at a few of its many forms and uses. It may be helpful, however, to sum up some of the things we have learned about the calyx by this brief review. We have seen that the calyx is formed out of common leaves which have been more or less modified or changed in shape and colour. Sometimes the calyx is still green, and the sepals are separate. At other times the sepals have grown together so as to form a chalice (as in the primrose), a hood (as in the monkshood), or an extinguisher (as in eschscholtzia). In some cases, as in the poppy, it falls off as soon as the flower opens, in others it remains. Then it may enclose the fruit, as in the winter cherry, or even be changed into a form of fruit, as in rose-hips and mulberries. In other cases the colour is so modified that the calyx looks like a corolla (as in the anemone, Fig. 74, and hellebore), and then the petals can be set apart for other uses. Such in outline is the story of the emerald chalice.

FIG. 87.—Guelder Rose, with outer ray of florets for purposes of attraction.

FIG. 88.—Abnormal form of Guelder Rose, with barren florets wanting.

CHAPTER XII

PETALS AND PERIANTHS

THE byways of Nature are many and pleasing. One may study flowers, leaves, fruits, pollen, fertilization, and a host of other subjects with the greatest delight and profit. But among all the themes deserving investigation, none can make a more powerful appeal than that which we are now to consider. For petals are the most highly developed portions of the plant, and, as such, display the utmost variation. The great end, the predominant purpose, which the petals serve, is that of attracting the insect visitors. They are the advertisement boards of the plant, the showrooms of our floral rivals, the hoardings on which they display notices respecting the good things which they have at disposal. But in their efforts to secure their ends the plants have resorted to the most varied means. Colour, size, shape, position, number, perfume are some of the means they employ with more or less success. In the more conspicuous plants, if the petals are dwarfed or modified to serve some special end,

other portions of the plant come in to fill their place. In the old days, before we understood the evolution of organs and the ends they served, the coloured parts were almost always known as petals. Now we know that the calyx, involucre, or stamens may be so modified as to supply the place of the petals. We pluck a wood anemone, for example, and find the petals have been set aside in order that the calyx may serve their purpose (see p. 154). Here we have a petaloid calyx, or sepals modified so as to appear like petals. Such a process serves some useful end, and if we take a near relative of the anemone, viz. the Christmas rose (*Helleborus niger*), we soon discover a clue. Here, again, the calyx is modified (*c*) to serve the ends of a corolla, and the petals are changed into curious tubes or nectaries (*n*), producing honey, and so alluring the winter insects (Figs. 76, 80).

In many of the lily flowers a similar process is at work. The tulip, for example, appears to have a perianth of six petals. In reality, three only are true petals, the other three being sepals. These outer organs, not being required for the protection of the plant, are set free for purposes of advertisement, and so the sepals take part with the petals in alluring the insects. Sometimes this process is carried so far that the three sepals combine with the three petals in making a tubular bloom, a bell or campanula-like blossom. I

FIG. 89.—Bird Cherry.

FIG. 90.—Lily.

have already told you that among our native lilies we find the bluebell or hyacinth. Its perianth is tubular, and the sepals are of the same colour as the petals. But if we gather a campanula, harebell, or Canterbury bell, and examine the blossom, we shall find its shape and appearance to be, superficially, exactly like that of the hyacinth. Both flowers are popularly known as bluebells, and to the casual observer it would seem to be a piece of botanical pedantry to separate the two sets of blossoms. Yet to the botanist they are wide apart as the poles. One is a monocotyledon, the other a dicotyledon. One has a true calyx, the other has not. In one plant the parts are arranged in threes or sixes, in the other they are in sets of five, though curiously enough the pistil in each case usually assumes a triple arrangement. To be more exact, in the hyacinth we have a plant which is closely related to the tulip, crocus, and lily. Its calyx, petals, stamens, and pistils are in sets of three, while its perianth or blossom is made up of calyx and corolla, sepals and petals combined. The campanula, which shares with the hyacinth the name of bluebell, is a dicotyledon, with its sepals, petals, stamens, and pistils in sets of five. The sepals remain green, and form a normal calyx. The five petals have combined to form a bell, the five stamens are arranged around the unopened pistil, and only in the stigmas, which are frequently three instead of five in number,

do we get a near approach to the hyacinth. It is the accidental similarity in the appearance of the bell-shaped blossoms which has led to their being confused.

In the matter of colour the petals show the most bewildering profusion. We have petals which are all of one colour, and others which are each of a different colour in one blossom. Some are specially suited for serving their ends at night or in early dawn, and others are only fitted for service in the day or at special hours. Some open and close periodically, some last only for a few brief hours, while others continue for weeks. Here is a blossom whose petals know no change, and there a flower which changes like a chameleon, having petals of different colours for several successive days. They change in this case according to a regular order, and are visited by different insects as their livery changes.

Thus in such common plants as the buttercup, rock rose, or primrose, we have one regular colour which undergoes no material change during the life-history of the plant. So the daisy, marguerite, dandelion, bluebell, and a host of other plants close their life-work as they began it—no colour changes have been undergone. In the case of most of our night-flowering plants, white or yellow being the dominant colours, no change will take place from the time of opening till the petals fade.

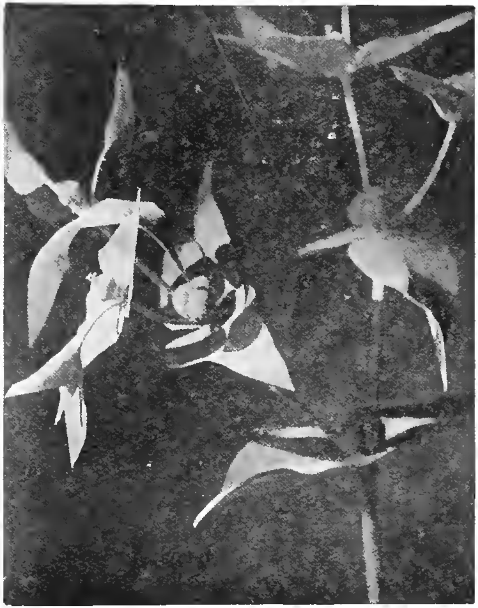

FIG. 91.—Caper-spurge.

FIG. 92.—Thistle.

But when we come to the mutable rose, and especially to the large group of plants which includes the forget-me-nots, borage, bugloss, and their allies, we are at once transported to a region of romance. Who has not observed with interest the changes and modifications which go on in the lungwort or the versicolour scorpion weed?

How susceptible to subtle influences must such plants as the goatsbeard, shepherd's weather-glass (or pimpernel), and even the common daisy be, when they shut up or open out regularly at certain hours of the day, or under various atmospheric conditions! I look out on my lawn at midday and it is white with the wee crimson-tipped daisy. As soon as evening shades prevail, the silvery carpet is exchanged for one of emerald green; the little plant has shut its eye for the night.

The shapes of petals have long been a pleasing subject of research. How wonderful and varied their modifications! Even the simplest forms are worthy of our notice for the ingenious way in which Nature cuts out the pattern. Folded up within the calyx the blossom usually occupies the least possible space; yet when the bloom is displayed it makes the maximum of show. The cup or chalice-like arrangement of the petals which usually prevails seems to be that which gives most gratification to the eye, while at the same time the least

possible hindrance to the visits of useful insects is presented. But where special insects are required for fertilizing the blossoms, what ingenuity is displayed in alluring them! The orchids, of course, present the most pleasing and romantic modifications, and their wonderful popularity is a tribute to the success they have achieved. But our everyday flora may be studied to great advantage in this connexion. Not only have we a goodly number of orchids of a modest type, but our peaflowers, including the vetches, gorse, broom, clovers, lady's fingers, and others, our honeysuckle, foxglove, nasturtiums (Fig. 81), snapdragons, and many similarly formed flowers, show the most marvellous and elaborate arrangement of petals. Spurs are formed, as in the violets and toadflax, honeysuckle and columbine (Fig. 83), out of the petals, to serve the purpose of honey-pots or nectaries. In other cases hairs are introduced to catch the pollen, block the entrance to intruders, or prevent the egress of insects till their task has been performed.

We have also the ingenious use of honey-guides —petals splashed with colour or ornamented with streaks, which tend to direct the insects which are in search of honey to the parts of the flower where it is secreted, and thus ensure their brushing the pollen-bags and dusting themselves with the precious farina (Fig. 28).

FIG. 93.—Climbers.

FIG. 94.—'I betook me to a farm' (*see p.* 194).

It is hardly necessary for me to dwell on the remarkable way in which plants like the foreign poinsettia have modified their leaves, bracts, scales, and sheaths, that they may be fitted to act as petals. These cases are, however, instructive, inasmuch as they supply us with a vivid object-lesson on the way in which petals have been evolved. The gorgeous and curiously wrought petal was once a modest leaf. By degrees it acquired a higher colour, a new shape, a modified position, and so was fitted to play the double part of Nature's decorator and the flower's advertiser. A detailed study of concrete examples would no doubt reveal to us much that is of further interest; but the foregoing will perhaps suffice to show us the general economy of petals in plant life.

I must not, however, close this short chapter without drawing attention to the close relation which exists between petals and stamens. The plant which is usually chosen to illustrate this subject is the beautiful white water-lily (Fig. 84); and if you will take the pains to examine one of these delightful blossoms when they are in season, you will be able to see how gracefully and gradually the stamen and petal run into each other. This will help us to understand the origin of double flowers. Plants which are so named usually have a great many more petals than single flowers. Sometimes the number is exactly doubled or trebled, but quite

frequently there is no arithmetical relationship. Sometimes one whorl of stamens is changed into petals, at other times the whole. When the whole are changed the plant cannot produce pollen. In that case it has to depend on some other method of reproduction for its continued existence. Do not confuse composites with double flowers.

FIG. 95.—Rose.

FIG. 96.—Leaves of Arum.

CHAPTER XIII

HONEY-POTS AND HONEY-GUIDES

MARVELLOUS stories have been told of the way in which travellers in foreign lands have been guided by birds to the rich stores of honey which the wild bees have laid up in hollow trees and other places. The birds are called honey-guides. But we have plenty of wonderful honey-guides at home, and some of the most ingenious honey-pots you ever saw. It may be said that all the conspicuous flowers of our meadows and hedgerows are provided with them in one form or another; but the variety is so great, and the devices are so wonderful, that I think we ought to give them our best attention. If you have learned the lessons I have endeavoured to set before you in the preceding chapters, you will know that the petals are those bright parts of the flower which give it the chief part of its charm, and make it easily seen. Florets are little flowers, many of which grow near together. They are not confined by any means to the daisy and its relatives known as composites. We find florets in the umbels, like the

carrot, parsnip, and cow-parsley, and in such plants as the guelder rose. In the composites, like the horse-daisy and foreign fleabane, or cineraria (Fig. 86), the outer florets are spread out so as to form an attractive ray, while the inner florets provide the honey and pollen. Many plants flower by night only, and close up during the day. These are nearly always yellow, like the evening primrose, or white, like the campion. If you pass by a field where the white campion is growing freely you will find that as the evening advances the blossoms expand, and a delicious perfume is exhaled. White is easily seen in the dusk, and many a fine moth can be captured among these fragrant flowers. Here the colour of the blossoms serves as a perfect honey-guide; and since plants with white flowers can keep up a show of blossoms without a heavy expenditure, such plants are usually fragrant. If you grow the white tobacco-plant in your gardens you will easily follow what I have said, and you may readily observe the moths on their rounds.

A gentleman one day called at my house and asked if I could inform him what kind of orchis he held in his hand. Though I did not profess to know the names of rare foreign orchids, I happened to know enough about our English plants not to be taken in. He had gathered a spike of horse-chestnut bloom and stripped off the leaves. If you will do so you will find that it might easily be mistaken for some of those charming flowers

Fig. 98.—Gentian.

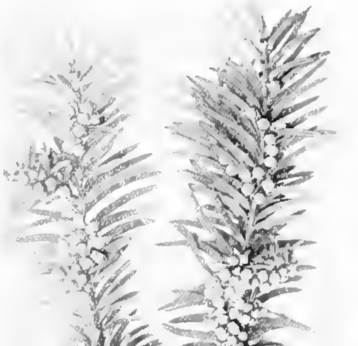

Fig. 97.—Yew.

Fig. 99.—Fairy Gold.

which come to us from abroad. And, indeed, the horse-chestnut is a foreign tree, though it has now become quite at home with us. The beautiful markings on its petals are the honey-guides which lead the insects to the honey-pots. (See fig. 28.)

There is a quite familiar plant known as the columbine, which has its petals developed into very long spurs (Fig. 83). These, too, are honey-pots, and it requires a long tongue to reach to the end. Would you believe that insects steal? Yet they do; and one often finds holes bitten through the spurs of such flowers by the bee or other insect which is bent on getting the honey out of the pot, though it cannot reach it in the proper way. Such are the attractions of honey; and I fancy there are boys and girls who sometimes get the honey, jam, and sugar in ways which are not a bit more honest.

Every one knows the snowball-tree, with its bunches of white flowers looking exactly like a ball made for rolling over the drawing-room carpet. This is the double variety of the guelder rose; i.e. in this case all the florets have been changed into rays like those on the outside of a daisy. The guelder rose which grows in our hedgerows sometimes assumes this form, but, as a rule, it is the result of cultivation. The usual form is represented by the fine spray of bloom shown in our illustration (Fig. 87), where only the outer florets are

changed into honey-guides, while the inner florets hold the honey. But I once found a specimen of this tree in which the whole of the florets were fertile, and no ray had been formed (Fig. 88). A few yards away grew the usual form having both kinds of blossoms, and by looking at the picture you will see that though they grew in the same hedgerow the common form is not so far advanced as the rare one. This rare form of guelder rose is almost exactly like the hemp agrimony in appearance and development. But see how much more conspicuous the one is which has the outer circle of florets set apart for honey-guides. When all the flowers develop in this way so as to form a snowball there cannot be any fruit or berries. In this case the plant which has honey-pots in the centre and honey-guides in the circumference stands the best chance of getting a living.

We have already given some attention to the hellebore or Christmas rose, but as we learn a lesson better if it is repeated in a new form, I will refer to this interesting plant again (Fig. 76). The sepals are changed into petals, and so are called petaloid. This sets the true petals free for other uses, and you will find them in the shape of dark green honey-pots at the bottom of the flower. This dark green colour, I should have told you, is often suggestive of poison. We find it so in the evergreens and other plants. The Christmas rose belongs to the buttercup family, and nearly all the members of

FIG. 100.—Mallow.

FIG. 101.—Lily.

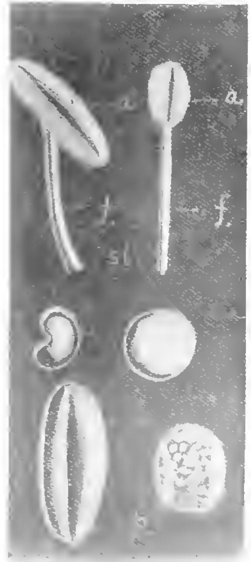

FIG. 102.—Anthers and Pollen.

that order (*Ranunculaceae*) are poisonous. The celery-leaved crowfoot, which grows in marshy places, produces a poisonous juice which beggars formerly employed for causing ulcers. The hellebore also is poisonous, and has long been famous in foreign lands on account of its marvellous properties. It is pretty certain that the honey of this plant is poisonous, at least to some creatures, just as the berries of the arum will kill the smaller birds if they feed on them.

The narcissus has come in for a good share of our attention, because it arrives at a season of the year when flowers are rare. It assumes a great variety of forms under cultivation, and its perianth has been specially developed in order to serve as a honey-guide. The nectar lies, in this case, securely in the delicate pots at the base of the long tube, and as the flowers are a pure white they are very fragrant (Fig. 48).

Though I have much more that I wanted to say on this subject, I can only give you one further illustration in this chapter. We are all familiar with the beautiful lilies which make the gardens so gay in summer (Fig. 90). These are of many kinds, and have been brought to our own country from many lands. Each different species has its own devices for luring the insects to its honey-pots. The crown imperial has an unpleasant odour such as wasps love. The white lily gives out a delicious perfume (Fig. 47). In the orange lily the anthers are filled with

dark pollen, which often falls on the petals and gives them an appearance similar to that of an old woman who has been taking snuff. Hence the plant is called in the north of England 'Snuffy Betty.' The form represented in the illustration has the petals covered with bright spots and projections, and these become denser towards the centre of the flower, where the nectar is. In a later chapter I hope to be able to return to this subject again, and then we shall have an opportunity of reviewing our results.

CHAPTER XIV

ONCE BITTEN, TWICE SHY

I PROPOSE in this chapter not to tell you what you ought to learn, but to give you a little of my own experience. Don't laugh at me when you hear what a simpleton I am. When we burn our fingers we ought to let the fire alone; and if we cut ourselves we ought not to play with knives. When we have been once bitten, we ought to be twice shy. But no one ever is so clever, and I am just as silly as every other enthusiast. Listen to my story.

I was still a beginner. Botany was always my favourite subject; but up till the present I had not enjoyed the best opportunities for studying it, owing to my other work. Now, however, I found myself in a veritable Eden. I am, of course, speaking of years long gone by. My health had been terribly broken, and I was obliged to live as much as possible in the open air. I found myself surrounded with beauty. Every hedgerow around my home bristled with plants which were as charming as many of them were rare.

The banks glowed with the colours of emerald and jacinth, turquoise and ruby, blending with gold and silver as a setting.

The bird-cherry (Fig. 89) blossomed profusely in the hedgerows. The clematis scrambled and struggled till it overtopped the hawthorn and hornbeam, and crushed out the life of its rivals along the narrow lanes. Bees were attracted by the curious orchids and the honey-laden blossoms; butterflies settled on the fleabane and agrimony; and when the dews of evening fell, and I leaned over a rustic gate to admire and reflect, the aroma of the white night-flowering plants was wafted toward me by the breeze, till dreams of the East came over me and made me sad.

It was during this poetic period—the memory of which lingers, even though the poetry has vanished like the perfume of the evening—that I found myself wandering one lovely afternoon along a country lane. One hand was already filled with the stars of earth which I had plucked, while the other was still at liberty for gathering other trophies from bank and hedgerow for examination in detail when I reached my home.

At last I espied a plant which I had never seen before, except in a state of cultivation. Its glaucous leaves, curious flowers, and caper-like fruits at once arrested my attention (Fig. 91). After a brief examination, I gathered a portion of the plant to add to my

FIG. 103—Catkins of Hazel.

FIG. 104.—Hollyhocks.

bouquet. I then observed that a quantity of milky juice or sap flowed from the portion of the plant which had been torn and injured, similar to that which comes from the poppy and dandelion, or of an orange colour from the celandine.

In those early days, when I was but a child in science, I always adopted the method which a child adopts of testing everything which came in my way. Without a moment's thought or hesitation, therefore, I put the milk to my lips, that its qualities, whether nectar-like or otherwise, might be ascertained. I then proceeded on my way, and discovering by my watch that it was nearly time for me to keep an appointment in a neighbouring village, I put my best leg first. But what could be amiss? Had some fairy, such as still existed—so the country folk would tell you—in those country lanes, given me a drug?

Cayenne pepper and horse-radish would have been quite mild by comparison. My tongue was parched, my mouth hot, and my throat dry and burning. My vocal organs were all unstrung, and if it should fall to my lot to be the choirmaster or precentor, as well as the preacher of the evening, the Fates alone could decide how I should proceed! It was some time before I could fathom the mystery. Such a trick had never been played on me before, and I did not dream that my much-loved flowers could do anything so base. At last,

however, it dawned upon me that I had partaken of the herb of immortality—or some other herb which threatened to send me to the immortals sooner than I wished—and now I was beginning to enjoy the process of transforming. I did not know one had to pay so dearly to join the genii. A painful process, truly, and if such was the price, who would wish to pay the penalty? I tried to allay the burning by drinking at a wayside rill, but found no relief. Then I betook me to a farm (Fig. 94) and got a glass of milk; but even this did not at once allay the irritation, or restore my mouth and throat to their natural state. I had made the acquaintance of an acrid spurge.

Some years passed by, and I found myself one day the happy possessor of a rare and charming volume known as *Gerardé's Herbal*. There I read the following passage: 'All the kinds of spurges are hot and drie, of a sharp and biting qualitie, fretting or consuming. First the milke and sap is in speciall use, then the fruit and leaves, but the root is of least strength. Some write by report of others that it enflameth exceedingly, but my selfe speak by experience; for walking along the sea-coast at Lee in Essex, with a gentleman called Mr. Rich, dwelling in the same towne, I took but one drop of it into my mouth; which nevertheless did so inflame and swell in my throte, that I hardly escaped with my life. And in like case was the gentleman, which caused us to take our horses, and poste for our

FIG. 105.—Acacia.

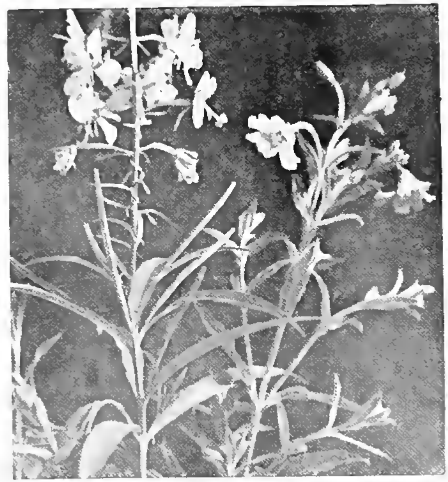

FIG. 106.—Rosebay willow herb.

lives unto the next farme house to drinke some milk to quench the extremitie of our heate, which then ceased.' Aha! thought I, then there have been other simpletons in the world besides myself! True; but surely after this I should be wise. Yet who does not know how easy it is to forget in time the most painful lesson? In fact, as many of us know to our cost, the things which are the most painful often seem to have for us the greatest charm and fascination.

Again the years rolled by, and I was roaming among the wonderful hills and dales of Lakeland, fully three hundred miles from the place where I had first made the acquaintance of the venomous euphorbia. Walking one lovely evening down a famous vale I once more chanced to espy the caper-spurge, growing in rich luxuriance 'over the garden wall.' My curiosity led me to pluck a spray and show the fruits to my companion, to whom I related the foregoing story. But so strong upon me was the habit I had acquired of tasting new and rare plants, that I once more fell into the trap. I was like the man who is under the fatal spell of the cup or the opium habit. There and then I put the tip of my tongue mechanically against the milky sap. Though the drop was of the tiniest, the consequences were identical with those I have already recorded, and for an hour or two the greatest inconvenience and suffering ensued. I was glad again to seek out a friendly farmer, and obtain

a glass of milk. You will laugh at my folly, and when you see the plant—you will do the same! We learn only by experience, and not always by that. We need line upon line, precept upon precept.

Perhaps you will ask me to halt a moment in my story and answer one or two questions. Nothing could be more gratifying. You wish to know in the first place what motive the plant can have, if a plant may be said to have motives, for harbouring within its tissues such an acrid poison. Let me answer for the plant by giving you a Latin sentence—'Nemo me impune lacessit.' You will please forgive me if I translate this bit of plant language for you, and at the same time expand it somewhat, so as to make the meaning perfectly plain. It is as though the plant should say, 'Leave me alone, and I will do the same to you. Touch me, and you'll meet your match. I do not mean to defy you, but I am bound to stand up in self-defence. I am not of an aggressive turn, but since there are folk in the world who will not mind their own business, I always keep a house-dog on the premises. Burglars will receive a warm welcome. Aggressors will be treated on their own terms and paid in their own coin. Those, however, who know how to attend to their own affairs, and leave me to do the same, will find me a very respectable neighbour, always ready to oblige and live on the most friendly terms.' If our caper-spurge had uttered this little oration before a company of

FIG. 107.--Pollen grains fertilizing a pistil

FIG. 108.—Stamen-bearer.

FIG. 109.—Primula.

fellow plants, they would have slapped their sides and cheered it to the echo.

I see the dignified thistle (Fig. 92), for example, stretching itself to the height of a dragoon guard among the plants and crying, 'Bravo, Sir Euphorbia! Them's my sentiments. I hear that people are always complaining about my bristling with bayonets, but I declare that I never made an onset on any one in my life. If others are so foolish as to fall on a British square when the soldiers are formed in solid phalanx, with spear points gleaming in every direction, whose is the blame if one of the spears fetches blood? Am I to be charged with a crime because I pricked the bare foot of a Dane who had the audacity to trample on me when trying to steal a march over the canny Scot?'

Then up rose the harmless nettle and exclaimed, 'Your words, gentlemen, are wise and true. I believe that I am a byword among the people. I hear men speak of me as if I were the very embodiment of evil. They reckon me and the hornet as on a par. Yet I say truth, friends, when I declare that my motives and intentions have ever been peaceful. I have enemies in plenty, but not one of them can affirm that I ever interfered with him until he first took liberties with me. If a man forgets that I have rights, and rudely infringes them, I feel in duty bound to stand on the defensive. Further than that, however, I have never dared to go.'

I fancy I see a flush of shame mantling the cheeks of some of the bystanders. There are some whose cry is for aggression. Gatling guns, torpedoes, warships, standing armies of ever-increasing numerical strength—these and the like they clamour to possess. But the thistle and rose, the nettle and spurge say, 'No! Let us use all necessary and lawful means to protect ourselves against attack and destruction. But with this let us be content. We take for our motto, '*Defence, not Defiance.*'

But let me now take up my story. More than twenty years after I had been first bitten, I was walking with a bright, intelligent lad in the neighbourhood of Windsor. It was just at the time when the leaves of the arum were beginning to show their vivid green colour amid the surrounding browns and greys (Fig. 96). We were talking about plants; and, pointing to one of the tufts of leaves, I asked, 'Why do not the cattle devour that tempting morsel? Is it not very dangerous for a plant to put out such conspicuous leaves at this barren season?' The question took my young companion by surprise, and as he could not answer I continued, 'Those leaves are protected by their biting properties. If any one were to taste them he would find that they are very acrid.' I then suddenly halted. 'That, at least, is what *they say*,' I added. 'But I ought to say I have never proved it, so if you like we will taste a leaf.' My young

FIG. 110.—Clover and Vetch.

FIG. 111.—Flower of Orchid.

friend was not to be caught. But I was still a simpleton, an enthusiast, so I plucked a leaf, bit off a tiny morsel and held it in my mouth. 'Some write by report,' says Gerarde, 'but myself speak from experience.' Soon my mouth was as hot and dry as when I tasted the euphorbia, and right glad I was when I was able again to cool my parched tongue!

We learn, then, that when an animal attempts to injure the spurge or arum the mouth is inflamed; if a nettle is attacked, it stings; if a thistle, it pricks. And these are the plants which thrive and prosper. Nettles fight no battles, yet where are they not found? The thistle never wages war, though its flowery battlements bristle with rapiers. Yet the thistle is everywhere. The rose has its prickles, yet we cannot go into a country lane in summer without finding the delicately-tinted petals of this favourite flower.

We frequently hear of young people being poisoned by eating the seeds of the laburnum-tree, which they have mistaken for peas, or the brilliant fruits of the deadly nightshade, which they thought to be cherries. A gentleman once brought me some plants on which his cattle had been feeding. The cows had been poisoned, and some had died, but no one knew the cause. At last it was suggested that they had been eating a certain plant which looked exceedingly inviting and perfectly harmless. 'Yes,' I said, when he asked me if it were likely. 'The

plants would certainly poison your cattle, and it is more than probable that your loss is due to their growing in your pastures.' Some things are all the more dangerous because of their harmless, attractive appearance. Among plants, as elsewhere, appearances are deceptive. Who would imagine that the innocent-looking yew (Fig. 97) would do any harm? Yet its dark green leaves are viewed with suspicion by the botanist, for he knows that a deadly poison lurks beneath. Every year many valuable cows and horses are poisoned by browsing thereon.

One more point, and our chapter will be complete. If we look about us we shall find that some of our commonest and choicest flowers, such as the sweet-scented honeysuckle, the nectar-laden clover, and the beautiful ox-eye, which are well able to hold their own, and even to extend their borders, have no bayonet points to protect them, nor any poisoned springs with which to destroy their enemies. That is true. But we must observe that there may be hundreds of ways of reaching one and the same end, and many plants which seem to be quite unprotected are, in point of fact, richly endowed with the means of self-preservation. They may not prick or scratch, sting or poison us, and on that account we are not immediately made aware of their character. Here it is that the study of botany comes to our aid. Characters run in families among the plants as

DEADLY NIGHTSHADE.

they do among ourselves. We know that the members of the buttercup family are generally dangerous, while the crucifers supply us with some of our choicest vegetables and most valuable foods.

Similarly, the labiates, which include the mint and thyme, pennyroyal and sage, are chiefly aromatic. Now, though these aromatics and essential oils make the plants very acceptable to man, who takes the plants under his protection for the purpose of enjoying them, they cause the cattle to pass them by. So they are saved by their virtues instead of by their vices! The gentians (Fig. 98), and hennas, wormwoods and galls, may be turned to good account by the chemist and physician, and we are almost entirely dependent on the plants for such valuable medicines as cocaine and quinine, aconite and belladonna, digitalin and nuxolin. It is quite common to hear people speak as though these things were intended solely for the use of man, but, while we gladly recognize their value when men have learned their uses, we are bound to admit that the plants possess these properties as a means of self-defence. If man became independent of perfumes and medicines, the plants would continue to produce their bitters and sweets, tonics and laxatives, just as they have ever done in ages long gone by.

CHAPTER XV

FAIRY GOLD

THE books will tell you that fairy gold is useless. There may be different kinds. All is not gold that glitters, and gold is only of use to those who know how to use it. But in the good old times, when the fairies used to ring the changes on cowslip and harebell foxglove and primrose, they found the golden pollen of the flowers of priceless value. Let us look a little more carefully at this gold-dust, minted into coins of a thousand shapes and values.

The easiest and best way to begin the study of pollen is to go to some large flower like the white lily (Fig. 90), or the hollyhock (Fig. 104). If it is a drooping lily you are examining you will see that six white threads hang from the blossom. On the ends of these there are carefully balanced six bags or parcels, all of the same shape and size—one on each thread. These are the anthers or pollen-bags, and each bag, if opened, will be found to contain large numbers of gold nuggets. If you examine the hollyhock or mallow (Fig. 100), you

FIG. 112.—Streptocarpus.

FIG. 113.—Musk Mallow.

will find quite a different arrangement, but the pollen grains will be quite as beautiful, and of a distinctly different kind.

The pollen of the hollyhock was the first kind I ever remember to have seen under the microscope. It is so long ago I scarcely like to think of it; but I can never forget how it charmed me. If you have a small microscope, and can get a mallow flower or hollyhock to examine, do so at once. You will learn more by one view of the actual thing than by all the books you can read in a year.

And what is pollen or fairy gold? It is the beautiful dust from the anthers of the flowers which has to be carried by some means or other to the pistil, in order that we may get perfect seeds and delicious fruit. All the meaning of this wonderful process you cannot understand at present. It has taken ages to discover, and even now there are many questions which the cleverest botanist is unable to answer. But if you will examine all the flowers you can get, beginning always with the largest, and will read what I am now about to tell you, you will see that fairy gold is worth your most careful study (Fig. 102).

Pollen is a kind of living powder or dust found in flowers. It is usually contained in special organs known as anthers, and the anthers, with the threads which attach them to the flower, are called stamens. To each

different kind of flower there is assigned a different kind of pollen. The shape, size, colour, quantity, and marks vary with every species of plant, and sometimes one kind of plant has different kinds of pollen—so fertile are the resources of Nature.

Now, as the different kinds of pollen have to be conveyed to the pistil in different ways, you may often tell much about the beautiful grains by their shape and appearance. Some pollen is carried by the wind, like that of the hazel (Fig. 103) and other catkin bearers, and some by the water; some by birds, bees, butterflies. moths, and flies; some by tiny and almost invisible insects; some by mechanical means; while some is grown so near the pistil that it falls upon it when ripe, and so has not to be carried at all. Botany books will tell you that some plants are wind-fertilized and others self-fertilized, and a third kind is cross-fertilized by insect agency, and so on.

In a general way, we may say that the earliest method of carrying pollen from one plant to another was by means of the wind. Look at the hazel with its pretty catkins in the early spring. These catkins are groups of anthers full of pollen. The pistils are the little red tufts found here and there among the buds. When the pollen is ripe the wind wafts it across the hedgerow, and a few out of the thousands of grains alight on the pistils, and so produce the nuts. If we have a

FIG. 114.—Seedling Horse-chestnut.

FIG. 115.—Daphne.

FIG. 116.—Water-lilies.

bad nut year, therefore, it is probably due to the fact that the pistils did not get any fairy gold at the right time for the carrying out of their business. Thus a wet spring often means a lean autumn. You will see that this process is, in one sense, very wasteful. The larger part of the pollen is blown away. Did you ever see a shower of pollen? If you live near a fir plantation you may easily do so. I was walking the other day along a country road near a clump of firs, when a sudden gust of wind caught my hat and nearly blew it off. At that moment a yellow cloud appeared among the fir-trees, and countless millions of pollen grains were set free.

When you have a microscope of your own, you will find it very pleasing to get a collection of anthers from different kinds of plants and compare the pollen of one with that of another. Some of this fairy gold is made into flat, round coins, but usually it is not minted exactly like our own half-sovereigns and sovereigns. You will find balls, cushions, rolls, triangles, cubes, hexagons, and numberless other shapes and patterns. Some kinds are perfectly smooth and glossy, others are rough-coated, covered with hairs, spines, pores, and protuberances, bands, stripes, and markings of bewildering variety. Usually, each grain is a simple and separate cell, but sometimes they are compound (Fig. 8).

Let me describe one or two of the kinds which you can easily examine with a lens or microscope. If you

have a large number of grains on a slip of glass they will seem to be of different shapes as you view them from different angles, just as a circle or square will vary in appearance from different points of view. The grains of the hollyhock and different kinds of mallow are usually globular and covered with spines. Those of the chicory are many-sided, and, as they are covered with markings, each aspect gives some new pattern.

You know the sweet musk with yellow flowers, which is so often grown for the sake of its perfume. Here the pollen is ribbed or grooved, the grooves being arranged in a spiral, or like the end of a cork-screw. I think one of the prettiest forms of pollen is that which you will find in the flowering branches of acacia (Fig. 105), which come over to this country in the winter along with the narcissus, garlic, and anemone, from the south of France and other lands. It is one of the compound kind, and looks, from some points, like a beautiful cushion, made up of four smaller ones, joined together and ornamented. In reality there are sixteen cells in the cushion. Perhaps your imagination will enable you to suggest a truer figure. In the evening primrose, the cedar and other kinds of fir, the garden clarkia—which belongs to the willow-herbs (Fig. 106)—and in other flowers, the pollen grains are made up of three or four cells held together by a sticky coating.

Sometimes the grains have pores, and these vary in

FIG. 117.—Seedlings. R. Fool's Parsley; L. Dead Nettle.

FIG. 118.—Top, Fumitory (*a*); Left, Buttercup (*b*); Right, Chickweed (*c*).

number, from one in wheat and cereals, two in colchicum, three in the evening primrose, and four in fumitory, up to a hundred or even two hundred in such large kinds as the hollyhock.

Fairy gold, like the gold of the merchant, is generally yellow; but as even gold may vary in appearance, so do the pollen grains. While the great bulk of pollen, like that which is found in vast quantities on the fir-trees is of a golden hue, we have some as white as silver, while at other times red, brown, orange, and even blue pollen grains are met with. It will thus be seen that they form a most delightful subject for study.

I must close this chapter on fairy gold by showing you its use. The pollen grains alight on the pistil of the same or another plant, and there begin to grow. Sometimes the pollen of a plant will not fertilize the flower which produced it, but what is called self-fertilization is common in other cases. Anyway, when a pollen grain has found the right stigma (or sticky part of the pistil) it begins to send out a growing point which resembles a tiny rootlet. This goes down the pistil and enters the part where the young seeds lie awaiting the coming of the pollen tube (Fig. 107). When the tube has gained an entrance into one of the seed-eggs or ovules, the ovule can develop. In this way it comes in time to be a perfect seed or fruit, with power to form a new plant.

Almost every one who grows flowers now cultivates different species of begonia. Try to get a look at one of these interesting plants when they are in bloom. In the centre of one is a number of lovely corkscrews. The other flower, which looks almost exactly like a Christmas rose (Fig. 108), has a number of stamens but no corkscrew-like bodies. This plant cannot fertilize its own flowers, but the pollen must be carried from the stamen-bearers to the pistil-bearers by insects. Years ago the students of botany made many mistakes because they thought God had arranged the flowers in such a way that it should be easy for them to set their seed. The fact is that many of the plants could not bring forth perfect fruits but for bees and butterflies or other creatures. These are the merchants, and the pollen grains are the gold nuggets by which they are able to do their business.

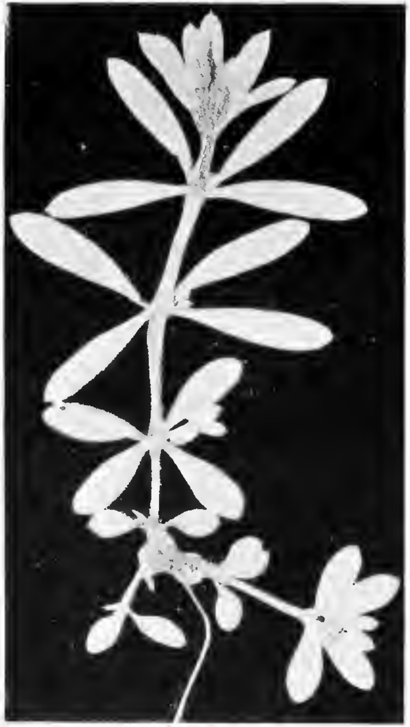

FIG. 119.—Galium Aparine, young plant.

FIG. 120.—Fumitory, developed leaf.

CHAPTER XVI

VISITORS AND HOSTS

HOW dearly we like to have friends coming to see us! What will they be like? Shall we be able to have jolly times with them? Will they know any new games? But I wonder if it ever occurred to us that the flowers are just as interested in their visitors, and many of them keep open house continually. Some of the commonest flowers are like a public-house. They stand by the wayside, and let any one come in who pleases. These flowers are either low in the scale, or they have become degenerate. What a lesson for us! But I want to-day to look at a few special plants which have contrived to select their own visitors, and which are in consequence more or less dependent on the regular arrival of their friends. In an earlier chapter, when speaking of the guides which flowers employ to lure the insects to their honey-pots, I promised to take up the subject again in a slightly different form, and so help to make the lesson more perfect.

Let us begin with the clover, because it is well

known and easily found (Fig. 110). There are many different kinds of clover, and there are also many other plants belonging to the same family which have flowers of a similar shape. Our peas and beans belong to this order. So do the vetches, medicks, restharrow, gorse, broom, woad or dyersweed, lady's fingers, and bird's-foot trefoil, to mention no others. On account of the resemblance between the flowers and butterflies, they are called papilionaceous flowers, and they are all designed to receive insect visitors. But the curious fact is that some of these plants will only entertain a select kind of insect. Let me illustrate this by telling you about the introduction of clover into New Zealand. When our farmers migrated thither, they hoped to be able to grow some of the honey-laden flower which they had been so used to seeing on their farms at home. When the first crop was gathered, they thought they would be able to grow some more from their own seed, but lo! not a seed was to be found among all the plants which they had grown. Though there were bees in New Zealand, they could not fertilize the English clover. It was necessary, therefore, to send for some bees, and these were put on board in winter. But when the warmer regions were reached, the bees awoke and got away! So they had to try again, and put the bees into a cold chamber. At last they managed to get them to New Zealand in safety, and ever since that time

FIG. 121.—Currant, Nipplewort, Nettle, Polygonum, Buttercup.

the farmers have been able to grow their own clover seed.

Go back to the chapters which tell you about the stamens, pistils, and pollen, and you will see that the fairy gold must be taken from the anthers in some way to the pistils. Then the pollen grows down into the seed vessel or ovary, and the seeds can be perfected.

Perhaps no English flower is more interesting to us in this connexion than the primrose. There are many kinds of primrose, as there are many kinds of clover. Nearly all of them have many flowers growing from one stalk. That is the case with the cowslip and oxlip, the lovely little mealy primrose and its sister the Scotch primrose. Such flowers are usually called by the name Polyanthus, which means 'many-flowered.' There is the primula, for example (Figs. 72, 109), and in almost every cottage window we may see other kinds during the year. But it was Darwin who helped us to understand the wonderful nature of the primrose blossom. Every child knows that there are two kinds of flowers. One has a pin's head coming out of its throat. That is the pistil. The other kind has a tuft of stamens, and as these resemble the threads which a weaver calls his thrum, they are known as thrum-eyed. This dual arrangement of the pistils and stamens is an index to the mutual interdependence of plants and insects. The bees, moths, butterflies, and other insects on the wing

need food. The flowers are able to supply that food, but they need service to enable them to fertilize their seeds. The insects alone could do this, so the primrose and the bee struck a bargain. They agreed that the flower should supply the bee with honey, if, on its part, the bee would distribute the fertilizing pollen grains. This involved an enormous amount of planning in order that there should be efficiency in the process. It was tacitly understood that when the primroses blossomed, the bee who sought honey should confine himself to the primrose, so that he might not waste the pollen by carrying it from a primrose to a wallflower or a daisy, where it could not serve its proper end. The bees sometimes make a slight mistake, for they carry the pollen from a primrose to its nearest relative the cowslip, and then a hybrid or cross is the result.

Fully to understand the process of cross-fertilization, it is necessary either to examine a set of diagrams or to dissect the flowers themselves. It will then be seen that the pollen from the thrum-eyed flowers is carried to the blossoms which are pin-eyed, while the pollen from the pin-eyed flowers is transferred to plants whose blossoms are thrum-eyed or short-styled. The effect of this is to prevent self-fertilization or inter-breeding, which is usually an unsatisfactory process, and to secure the production of finer and better seeds. It will be observed that the primrose holds its head erect, while

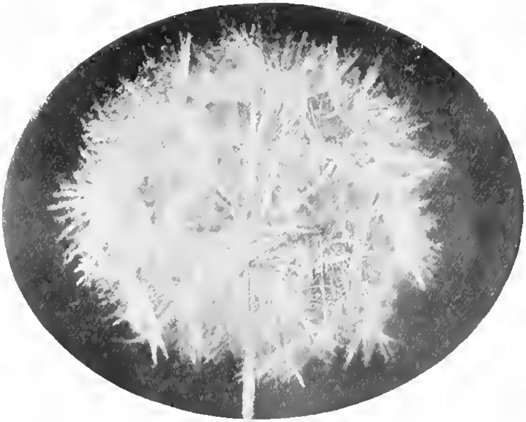

FIG. 122.—Parachutes of Goatsbeard.

FIG. 123.—Down from Thistle.

the cowslip droops it, and the celandine closes its blossom at night. Wordsworth has alluded to this. Speaking of the little celandine, he says:

> Blithe of heart, from week to week
> Thou dost play at hide-and-seek;
> While the patient primrose sits
> Like a beggar in the cold.
> Thou—a flower of wiser wits—
> Slipp'st into thy sheltered hold;
> Bright as any of the train
> When ye all are out again.

The probability is that the pins and thrums, or styles and anthers of the primrose, so effectively close the tube of the flower that the raindrops cannot reach the honey and spoil its flavour, and thus the primrose is ever open to the visits of the vagrant fly.

Let us now turn to the stately foxglove (Fig. 23). It would require a volume to give the full history of this romantic flower. Dr. Withering spent ten years in its study, but he had not then learned all there was to be learned. It would be well for you to obtain a book like Sir John Lubbock's *British Wild Flowers*, and examine the drawings there to see how the stamens arrange themselves from day to day, so as to secure the greatest amount of good from their visitors, as well as to render them the largest service. The foxglove *ought* to have five stamens. But it is a nonconformist, and has thrown one of the five out, so that it may be able to arrange the remaining four in pairs, and bring them into

line when the visitors arrive. Observe that the shape and size of the blossom is exactly that of a humble-bee. And now notice the dark spots inside the thimble-shaped corolla. The flowers very closely resemble one of the pentstemons. In the salpiglossis, the pentstemon, and the streptocarpus here shown (Fig. 112), we have lines, stripes, or marks instead of dots and dashes. But the purpose in each case is the same—to guide the insect to the honey.

If we examine the musk mallow carefully we shall find that it cannot fertilize itself (Fig. 113). It has honey-glands at the base of the flowers, and its pretty blossoms prove attractive to the insects, which regale themselves on the nectar, and then carry away the pollen to another plant. This process is going on every fine day during the summer with thousands of plants, and so it is that the flowers continue to thrive and multiply. If the insects perished, most of the flowers would perish also, and if the flowers died out we should lose our insects as well.

It often happens that we have a fine warm day in spring which awakens the bees and calls them forth to their duties. But what will they find so early in the year? The ivy will be in bloom, and very interesting it is to watch the bees alighting on the little honey-laden blossoms. It usually happens that the early flowers appear before the leaves. Here is a little sprig of the pretty daphne, with a couple of flowers of the winter

FIG. 124.—Willow-herb (*Epilobium*).

FIG. 125.—Catkins of Willow.

FIG. 126.—Bulrush (*Typha angustifolia*).

aconite. The flower of the daphne is small, but its fragrance is such that the bees have no difficulty in finding it (Fig. 115).

Like every other branch of botany, this is so large and engrossing a theme that one would like to be able to devote a whole volume to the study. But I have to content myself here with a few illustrations from the hedgerow and meadow, the garden and greenhouse, and then pass on to something else. The choice cinerarias and azaleas, the camellias and orchids, the ixias and gloxinias of our conservatories would all supply us abundant material for study and entertainment, and I must rest in the hope that what I have said will induce some of my young readers to press their researches further.

CHAPTER XVII

A VISIT TO THE NURSERY

YOU need not be afraid, for here you will not find babies crying, or naughty little children pulling dad's beard, or tearing nurse's hair. In Flora's nursery the young ones are all well behaved. I want you to come with me to-day, and have a look at a few of the seedlings which have sprung up during the past few weeks. We have had the April showers, and they will be followed by the May flowers. Let us look at some of the May flowers now that they are young, for they will teach us many things.

Remember what I have told you about monocotyledons and dicotyledons (see p. 95), and now examine the leaves of these little plants. In their infant form you can still see the seed-leaves formed from the two cotyledons. Notice how plain and simple they are —as babies ought to be (Figs. 117, 118). Plain children often grow up into handsome men and women, and so do the plants which have the plainest seed-leaves. Now observe how different the second set of leaves is from

FIG. 127.—Winged fruits (*Samarae*) of Ash.

FIG. 128.—Winged fruits (*Samarae*) of Elm.

the first pair. Sometimes the leaves change gradually, and the second set is very similar to the first, although the last leaves are widely different. In the chickweed (Fig. 118 *c*) the differences are never very great, but in the fumitory (Fig. *a*) the difference is very remarkable. So it is in the buttercup (Fig. *b*) and many other plants. Now there must be a meaning in all this, and every new fact must have its explanation. It would need a volume to set forth all the truth about the nursery, the cotyledons, and the leaves, and I shall have to refer you to more advanced books when you have done with this.

As we proceed, however, you will get a glimpse, now and again, into the secrets; and every new fact you acquire will make you eager to know more. One of the prime uses of the cotyledons is to supply the young plant with food, until it is able to find it for itself. They are like breasts or bottles which supply milk to the infant till it is able to take other kinds of nutriment. As the cotyledons have to be packed into seed-cases in the cleverest possible way, they are usually so formed as to fit into their cases exactly, without waste of room in the cot, or waste of material in the seed.

It is so, again, with the young leaves. The buds are often formed in little narrow corners, at the bases of the leaves, and this fact helps us to understand their shapes. Petals are packed in the calyx with the same care, and if you look at the photograph of the

primrose you will see that each petal has a little bit supplied out of it. Try to pack the petals into the calyx of this particular shape and you will see the explanation.

But now if we look at a few more leaves we shall see that their shapes have been largely modified by their surroundings. The second leaves of fumitory (Fig. 118 *a* and Fig. 120) are a good deal snipped and divided. We find such leaves constant on plants which have to struggle to obtain light and food. If you examine the water-lily, which lives in quiet backwaters, you will see that its leaves are large and flattened, without any of these snippings and divisions. Then if you take the crowfoot, which lives in running waters, you see that some or all of the leaves are finely divided. This is a great advantage. The rushing torrent would tear them to pieces; so Nature, like the kind mother that she is, takes her children in hand, and does for them gently what others would do cruelly.

Now work out these ideas and see how they apply to the leaves of trees, or to those of bracken growing in the shade, and the umbels which flourish in the hedgerow. Young plants show us in a beautiful way how all this wonderful change in shape has been brought about, and it is to such facts as these that we owe the marvellous variety and beauty of our native and foreign plants. Many writers have told us about these things, but there

FIG. 129.—Seedling Sycamore.

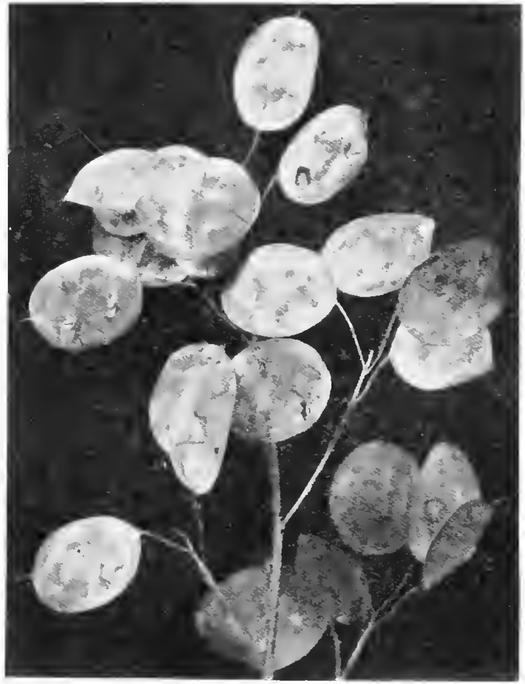

FIG. 130.—Fruit (dissepiment) of Honesty (*Lunaria*).

is nothing like going direct into the nursery and learning them for ourselves.

As this is to be a very short chapter I shall only refer to one other subject, out of the many on which we may gain light by a visit to the nursery. You will have to follow me carefully if you want to see the beauty of this lesson, and I must ask you to recall some of the facts which we have already learned in former chapters. One thing which we have been taught is that the gaudy petals of our choicest flowers are modified leaves. Some of the leaves were set apart to form the calyx or chalice, others to form the bloom.

Another thing which you have probably learned is that flowers whose petals are arranged like a cross are called crucifers. The wallflower, radish, and mustard have their four petals arranged in this way. Now, if we take a young plant from the nursery, such as the chickweed (Fig. 118 *c*), or the bedstraw and crosswort (Fig. 119), it will be easy to see how exactly the leaves resemble petals in their arrangement. I have taken a few nature-prints in order to show you this arrangement, and as there is here no colour of any kind to trick the eye, or throw it off its guard, it is almost impossible to believe that we have not here the four petals of a crucifer. It is such studies as these that show us the real life-history of the plant, and make us feel the value and importance of the nursery.

And now let me tell you how you can make a collection of beautiful nature-prints of seedlings and leaves, with the least possible expense and trouble, and yet with the greatest truth (Fig. 121). All you require is a sixpenny frame such as photographers use for printing. Into this fit a piece of plain glass, quarter-plate, cabinet size, or half-plate, as the case may be. Now take a thin leaf from any of the plants near at hand, and lay it flat on the glass. Place over this a sheet of self-toning photographic paper, fix the back, and put it in the sun. In a little time you will have an exact likeness of the leaf on a dark background. You wash the paper, put it into some hypo as directed by the instructions, then wash again, and when it is dry your photograph is complete. Or you can get postcards and make a set of leaf-prints or seedlings in this way, and send them to your friends. A collection of such prints, with the name of the leaf or plant neatly written on the back, will be a worthy subject to work on, and will teach you many things about the plants which you will not be likely to learn in any other way. As the prints are in reality negatives, they can easily be turned into positives by putting in the veins with a fine pen, and then the whole can be washed over with transparent colours of the tint required to give the exact appearance of the study as seen in Nature. How much better is such an occupation than many of those which our young people indulge in for pastime!

FIG. 131.—Floating seeds of Tragopogon.

FIG. 132.—Hop-like fruit of Elm.

CHAPTER XVIII

BALLOONS AND FLOATS

MAN has discovered what Nature long ago invented. There is a vast difference between invention and discovery. Look at the pretty parachutes of the dandelion and goatsbeard, or the thistle (Fig. 123), and willow-herb, and say if the arrangement is not perfect. In dealing with the calyx I told you that it is often so greatly modified that one would hardly recognize it. That is true in the case of the calyx of the goatsbeard (Fig. 122). Like the dandelion, this plant has a yellow flower, and a fluffy ball follows. At the base of each of the parachutes is a seed. Blow one of these off (as in Fig. 73), and you see that the feathery calyx acts as a balloon. Now examine the seed, and you will find that it is covered with grappling-hooks, so that when it comes to land it may be held secure. The hooks point in such a direction that the seed is held more firmly in the soil the further it sinks, and every detail of this wonderful seed shows that it has been arranged with a view to its widest distribution and its greatest security. Hence

this class of plants is the largest and most widely distributed in the world. The goatsbeard (Fig. 131) and dandelion belong to the composites, an order which contains the daisy and thistle. Evidently this group of plants has found co-operation and combination pay.

There are a number of other plants whose seeds have a downy pappus to help them float away to a distant home. Here, for example, is the willow-herb. There are quite a number of species of this plant in Great Britain. The two best known and most showy are the codlings and cream and the French bay (Fig. 106). The former grows in damp ditches and marshy places, and has quite large flowers; while the French bay is somewhat more rare, but quite as handsome. In fact, we often find it under cultivation on account of its bright spikes of crimson flowers. The leaves of these plants closely resemble those of certain kinds of willow, hence the name willowherb. The scientific name, epilobium, suggests the fact that the flower grows at the end of a long pod or seed-vessel. When this is ripe it splits open and reveals the seeds surrounded by a cottony down (Fig. 124). This helps them to float off from the plant when there is a breeze, and so the seeds are transported to a place distant from their home.

The willow is too well known to need description. When the catkins of some of the species fall to the ground, they often have an appearance very similar to

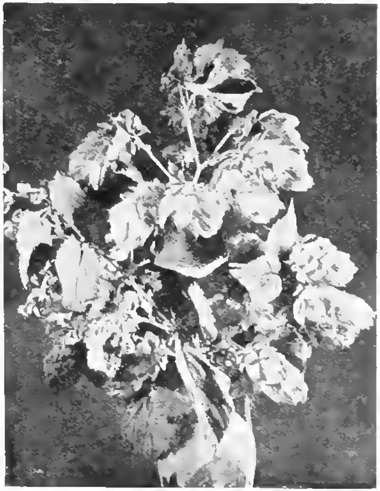

FIG. 133.—Flowers of Hop; staminate forms, large, on the right, pistillate or female on the left.

FIG. 134.—Flowers and seeds of Coltsfoot.

that of a woolly bear caterpillar (Fig. 125). Sometimes this cottony material seems to be intended to keep the seeds snug and warm, and if you open a broad bean pod you will be struck by the velvety feeling of the inner lining. Cotton is obtained from the seed-pod of a number of plants, and there are trees which produce a similar material which is not of any service in manufactures. Hence they are called false cotton-trees, and if you lived in certain foreign countries you would sometimes almost fancy there had been a fall of snow, owing to the abundance of this cotton-like down. It will be interesting to try and make a collection of all the plants whose seeds are associated with downy matter. The bulrush (Fig. 126) will be among the number.

Another set of fruits may be called aeroplanes, because they go through the air somewhat after the fashion of the new style of balloons. If we stand near an ash-tree during a gale in winter, we shall see the ash-keys (Fig. 127) go sailing away one after another in different directions, and shall be greatly pleased to notice their curious movements and gyrations. While the ash has only one flange or wing, or the seeds grow separately, we find such fruits as the maple and sycamore growing in pairs, and so they help each other. They look almost exactly like the blades of a screw connected with a steamer.

The lime differs from these, again, in having a long,

flat bract, which serves the purpose of a wing or float. If, after the April showers have fallen, we go and look under the elm-trees we shall find the ground covered with green things, which appear neither like seeds nor leaves. If we glance up at the tree we shall find that it looks very much as if it were covered with hops. The soft green of the flowers contrasts strongly with the sombre bark. Here, again, we have the fruit, and the resemblance to hops reminds us that the two groups of plants, i.e. the elms and the hops, are very nearly related (see Figs. 128, 132, 133).

How successful this method of floating the seeds by means of wings is, may easily be shown. I was working in my garden this morning, and found among the seedlings this young sycamore (Fig. 126). Now, the parent tree cannot be found within a very long distance of my house. Yet the seed had been brought very quietly on the wings of the breeze and deposited just in the right place for it to grow. Had the plot of ground been left uncultivated for a time, a fine young sycamore would have occupied the waste place; and it is in this way that Nature is constantly depositing seeds of a great variety of kinds in every possible locality. And if these seeds do not often produce perfect plants, let us not suppose that they are wasted. They afford food for a multitude of insects, birds, and animals, they convert useless material into useful, they prepare the way for

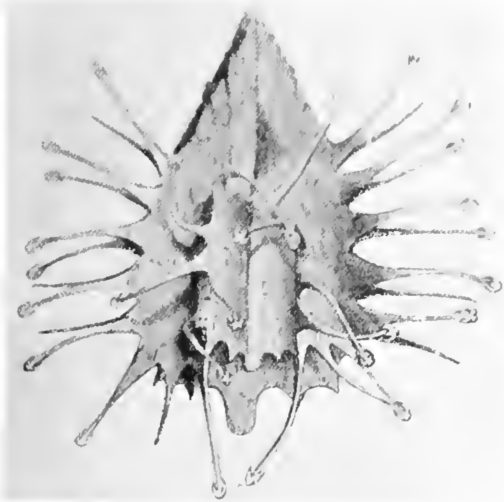

FIG. 135.—Grapnel Plant, Fruit.

FIG. 136.—Enchanter's Nightshade.

other plants, and in their decay they help to enrich the soil.

I must not omit here to draw attention to one of the pretty devices of Nature for protecting the seeds against the rain and other foes. If we observe the dandelion in fine weather, its blossoms will be open during the day, and will close at night. If, however, the day be wet and dark, the flowers are chary of opening, and will fertilize themselves. When the flower is over, the flower-heads droop, and so allow all the moisture from the dew and rain to run over and off them. The involucre shields the young seed till it has ripened, when, by some mysterious means, the heads begin to arise. When the sun comes out, the pappus expands, and then it is easy for any passing breeze to waft the seed away. It is so with the coltsfoot (Fig. 134).

In all these studies we have to beware lest we be misled by appearances. Here, for example, is the fruit of honesty—silver pennies! Should not the silver penny always be the reward of honesty? Honesty is a crucifer, that is, it has four petals like the wallflower, arranged somewhat in the form of a cross. The seed vessels are very curious (Fig. 130). This silvery portion is called by botanists the dissepiment, and to it the seeds are attached. They do not act as floats like the samarae of the elm or sycamore. As they somewhat resemble a moon, the name of the plant is drawn from the similarity,

and the botanical name of honesty is lunaria. There is an old tradition that the plant will not grow except where the people are good and trustworthy. If that is so, you will always be safe if you enter a cottage whose garden is adorned with this old-fashioned flower.

Many seeds and fruits are floated by the water. Indeed, the Coral Islands in the Indian Ocean and elsewhere are largely indebted to the sea for bringing them the seeds which produce their earliest vegetation. The musk, which is now so frequently found by the banks of our English streams, has been distributed in this way. The Egyptian water-lily or lotus is also dependent on the waters of the Nile for carrying its curious seed-vessels to distant places. One might almost compare these fruits with the rose of a watering-can. While immersed in the water, the capsule decays and the beans fall into the moist mud (Fig. 85).

WATER LILIES

CHAPTER XIX

SWEETHEARTS AND HANGERS-ON

WE must now look at a totally different kind of fruit. In the first place, we have those which stick to the dress of the passer-by and get entangled in the hair and wool of animals. Their name is legion, and they are found in every land. Many of them, however, are not suitable for photographing, and a really good series of illustrations could only be obtained by making drawings from Nature.

Perhaps the largest English plant of this kind is the burdock. It has fruits in round heads the size of a marble, and boys are fond of sticking them on their coats and calling themselves Billy Buttons. Naughty boys also put them in their sister's hair, and when that is done it is a terrible task to get them out. When burs like these get into the wool of a sheep they may be carried for miles, and are frequently conveyed with the skins to foreign lands.

Then there is the herb bennet or avens, and a more interesting fruit it would be difficult to find.

Avens is a member of the rose family, and has flowers not unlike a yellow strawberry bloom. When the seeds ripen, the pistil grows into a shepherd's crook. In time a part falls off, and leaves the seed with a curved stalk which easily catches hold of anything in its neighbourhood, and so gets carried to a distance (Fig. 137).

Cleavers or goosegrass is another of these sweet-hearts. The seeds (Fig. 37) are about the size of a small pea, and are surrounded with recurved bristles or grappling hooks. These are well adapted for catching hold of cloth or wearing apparel, and one can hardly go for a walk through the fields and woods in autumn without becoming covered about the legs with the tenacious fruits. Then we must mention the enchanter's nightshade, the flower of which is shown in Fig. 136.

The houndstongue is another terror in many places. The plant is related to the borage. Forget-me-not, and viper's bugloss, and other plants are very ready at the production of sharp hairs and spines for purposes of protection. The houndstongue delights in dry, sandy places, and will thrive where many another plant will perish. Its seeds are very much like a currycomb, used by grooms, and in this respect they are similar to those of certain buttercups and clovers. The best known of the buttercups with holdfast seeds is that which grows in cornfields (*Ranunculus arvensis*, L.) with small yellow flowers.

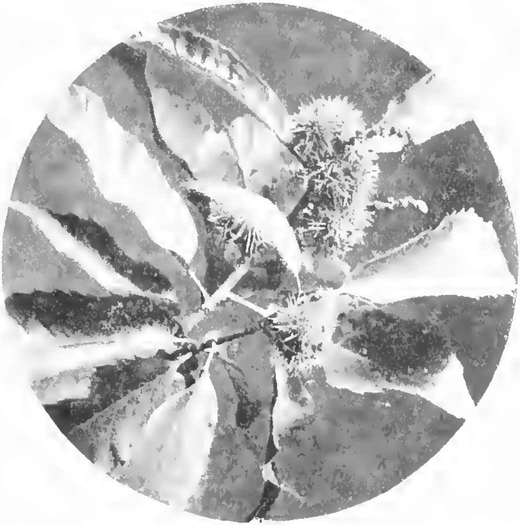

FIG. 138.—Sweet Chestnut

FIG. 139.—Red Currant.

Here, again, it would be a pleasing task to make a collection of all the fruits or seeds which show this peculiarity. We might add another group, because of the bur which accompanies the fruit, though it often has an entirely different use.

Here, for example, is the bur-reed. It is a water-plant, and the fruit, as you see, is sharp-pointed. I fancy this is a protection against foes. It is certainly so with the thorn-apple (*Datura*), which is often grown in gardens, and with the horse-chestnut. Then there is the Spanish or sweet chestnut, whose fruits are found secured enclosed within a bur which it is exceedingly unpleasant to handle (Fig. 138).

These are but hints on a wide and interesting subject. Look for the sanicle and the woodruffe among other common plants, and examine the wonderful fruits of some of the trefoils. Then you may extend your studies to the water-chestnuts and calcitraps of foreign lands (Fig. 135), and you will be amazed at the fertility of Nature's resources and devices.

CHAPTER XX

DAME NATURE'S TUCK-SHOP

WHAT boy does not love the tuck-shop? Some of us envy the young princes who have a shilling a week to spend on tuck; but others say, 'What a miserable allowance!' Tuck is good, but one may have too much of a good thing. Here is a fruit which in some places bears the name of wineberry, because it is so rich and juicy (Fig. 141). The same name is applied to the fruit of the red currant by the country people in some of our northern counties (Fig. 139). If the juice of these fruits is squeezed into a glass it might easily pass for wine, and, indeed, the juice is frequently fermented, and so converted into real wine.

In appearance, the wineberry is exceeding like our own blackberry or bramble fruit, and all who have had the opportunity of gathering this fruit by the handful, from the rich clusters which often adorn our hedgerows, will agree that Dame Nature's tuck is of the finest quality. This family of plants is rich in fruit-bearers, or I may say that it has an unusual number of members whose

FIG. 140.—Blackberry, fruit of bramble.

FIG. 141.—Wineberry.

fruit is of the most delicious kind. The wineberry and blackberry (Fig. 140) are closely akin to the dewberry and raspberry, though not very nearly related to the gooseberry and currant.

It is here we must place the strawberry (Figs. 75, 143). The fruit of the wild sort is usually small, but if it is gathered when perfectly ripe, and a number are eaten together, the flavour is often exquisite. What beautiful specimens are now produced in our gardens and nurseries! I will not trouble you with the scientific names of these different kinds of fruit, such as drupe and achene, but I should like you to study their forms, and see in what respects the strawberry, for example, differs from the raspberry. These differences are striking and suggestive, and will further illustrate, what I have already insisted on, that the resources of Nature are infinite.

There is another group of fruits found among the plants of the rose family. Without making fine distinctions I may mention the apple and pear, the quince and medlar, the service-tree and the rowan (Fig. 142). The latter is often called the mountain ash, because its leaves resemble those of the ash (Fig. 127), while it is fond of elevated or northern localities. Though the fruit is not palatable for us, the birds devour it greedily, and its bright clusters make a beautiful table decoration.

Then we have the hawthorn with its red berries, which supply many of our feathered folk with food during

winter (Fig. 144). In fact, it is a common saying that if the hips and haws are abundant we shall have a cold and severe winter. The logic is not satisfactory, but the idea behind it is a pretty one. He who feeds the ravens will make provision for them in summer, that when winter comes they may eat of the fruits which they have not garnered. But it must not be supposed that this is a warrant for idleness. When the birds come and feast on the rowan or hawthorn, the rose-hips or the sloes, they find some rich and wholesome pulp for their enjoyment. But each fruit contains its seed or seeds—one in the sloe, five in the apple and pear, as a rule, and many in the hips and the haws. These have to pass through the body of the bird, and, when the spring comes, new plants will flourish where the birds have dropped the seeds.

The sloe, also, which is the fruit of the blackthorn (Fig. 145), belongs to this order, and when we examine it carefully, we find that we have a third kind of fruit to deal with. The strawberry has its little seeds dotted about outside the luscious pulp. In the dogrose the seeds are inside, and are surrounded with little hairs and an outer covering of fleshy matter. But when we get to the plums (Fig. 146) we find what is called a stone fruit. Here are the damson and Victoria, the cherry (Fig. 147) and bullace, with many another favourite fruit, all from the same order, rosaceae. Peach, nectarine, apricot, and almond (Fig. 149) are

FIG. 142.—Fruit of Rowan or Mountain Ash.

FIG. 143.—Wild Strawberry.

among the many choice articles kept in Nature's tuck-shop, which come under this heading.

Have you observed the colours of our native fruits? Has it ever occurred to you that they are nearly all red or purple? I am referring to the kinds which have pulpy material along with the seeds. Among the red ones we find the hips of the roses and the haws of the whitethorn. Then there are the fruits of the strawberry, rowan, bryony, lily of the valley, honeysuckle, sea buckthorn, daphne, cranberry, holly, guelder rose, cherry, arum, raspberry, bearberry, bog whortleberry, cowberry, and others. Then, for darker hue, through purple to black, we get the sloe, bramble, wild plum, belladonna, elder, bird cherry, bilberry, privet, buckthorn, bittersweet, ivy, crowberry, and many more. Now, will you try to find out why this is? And let me ask you to study the wonderful changes in colour which these various fruits undergo in their passage to the darkest shades.

You observe that hitherto all our fruits have been of some shade of red or purple. Are there no exceptions? We fortunately have, either wild or acclimatized, a few fruits of another kind. If we take that of the mistletoe (Fig. 150), for example, we shall find that it has a whitish hue. But then this plant is a parasite, and so we might expect it to differ from those plants which support themselves entirely by their own industry. The

pulpy matter outside the seeds of the mistletoe is very viscid. When a bird has been feeding on the fruits, he wipes his beak on a tree, and in that way the seed is usually planted. This parasite will grow on a great many different kinds of trees, and if you ever go to the Botanic Gardens at Oxford you will have an opportunity of seeing one of the largest natural collections of hosts with the mistletoe to be found anywhere in the world. If you have apple-trees in your orchard, and would like to grow a beautiful branch of the mistletoe for use at Christmas, take some of the ripe berries and stick them between the crevices of the bark of your apple-trees. Then watch the young plants as the time goes on, and you will be greatly interested in their progress.

The purest white berry ever seen in this country is found on what is called the snowberry-tree (*Symphoria racemosa*, Ph., Fig. 151). The plant is so thoroughly at home with us now, that one might easily imagine it to be a native. But we have no native fruit-tree with a white berry. The nearest approach to it is the acid fruit of the arbutus or strawberry-tree, often cultivated, but no doubt truly wild in Ireland around the lovely Killarney.

But I think the most remarkable fruit to be found wild in this country is that of the spindle-tree or euonymus. There are many foreign species now grown in this country, and these have similar fruits,

FIG. 144.—Haws, fruit of Whitethorn.

FIG. 145.—Blackthorn blossom.

only that they are often even more striking in appearance than our native species (Fig. 152).

I may here depart from the rule which has guided me up till the present, and quote the words of another writer respecting the spindle-trees.

'Although it has been known for very many years, the broad-leaved spindle-tree (*Euonymus latifolius*) is even now an uncommon plant. It is much the handsomest of the Euonymuses, from its broad shining leaves and large red pendulous fruits, with orange-coloured seeds, which, when the capsules open, are suspended from the cells. Even the wood of this species is, during winter, much handsomer than that of any other. However, the merits of the common kind (*Euonymus europaeus*) are of no mean order. In the first place, it is thoroughly hardy and summer-leafing, and will thrive in light, sandy soils, better than the generality of shrubs, while, though the flowers are inconspicuous, the fruits are highly ornamental. When the exterior of the fruit capsules acquires its bright rose-colour, a tree thickly studded with them is very attractive; while, after a time, an additional feature is added when the capsules split open, thus leaving the orange-coloured fruits which are contained therein exposed to view, and in this condition they will remain a considerable time. It is generally met with in the character of a shrub, but, if trimmed up a little during its earlier stages, will acquire

quite a tree-like habit. There is a variety of the common spindle-tree in which the capsules, instead of the ordinary pink colour, are white, and, though not so showy, it is well worth a place from its distinctive character.'

But I must close this chapter, or we shall be in danger of having too much of a good thing, and that would be an evil. Although Nature has not fitted our climate for the growth of grapes (Fig. 153), oranges, bananas, mangoes, custard apples, and the thousand other delicacies with which her tuck-shop is stored abroad, yet the grape is easily grown in England, and forms one of our most delicious fruits.

I might have said much about our nuts and other fruits, but must be content with the briefest allusion to them, so that they may not feel slighted. The walnut, chestnut, almond, filbert, and even the common hazel nut (Fig. 154) are all exceedingly nutritious, and the sweet kernel is a favourite with most. Truly, with such a variety of fruits for man and beast, we ought to be grateful, and render thanks to the Giver of all good for the bounty of His hands.

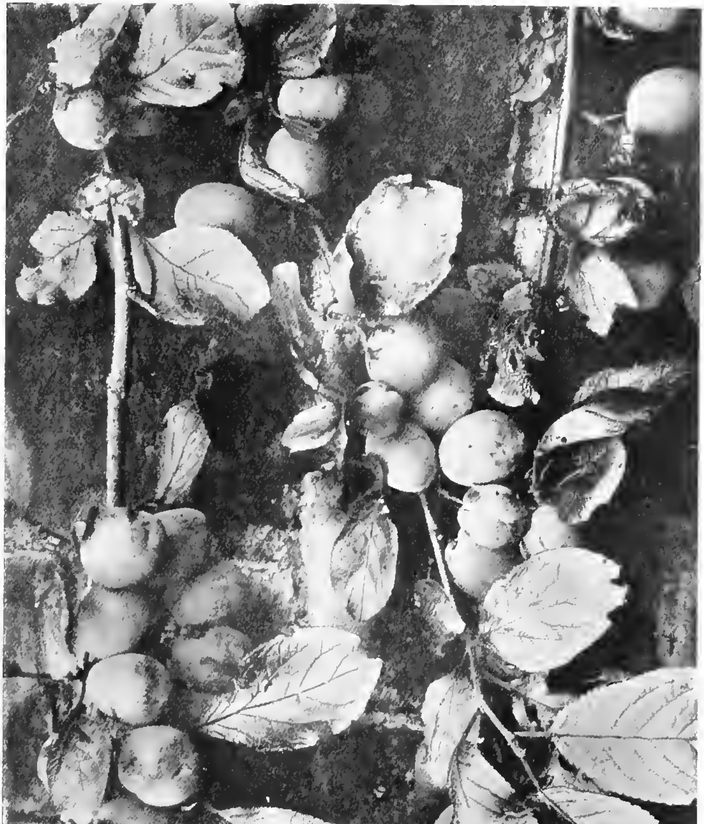

FIG. 146.—Plums.

CHAPTER XXI

IN THE SHOW-ROOM

LET me take you round to-day and show you a few of Flora's wonderful patterns and fashions. It is always an interesting day when Mamma promises to take her daughters to see the newest style in dresses and mantles, bonnets and hats; but Nature can make quite as wonderful a display as any of our London milliners and dressmakers. In fact, it is from Flora's realm that the patterns of leaves, flowers, fruit, and other delightful things are borrowed; so we shall do well to go direct to her. Nature, also, is a first-rate hand at copying. Flowers are made to resemble insects; leaves and blossoms are fashioned after the model of a thousand other things in the animal realm; and when Flora has made a happy copy she seems to delight to use it in every possible way. One of the charms of botany lies in the fact that we can take up its study in so many different ways. To-day, therefore, we will look at it in the same light as a young lady views the fashions and patterns in reference to dress.

Let us begin, then, by observing that many plants look exactly as though they had copied the fashions from ourselves. How many flowers there are which, either in leaf, blossom, or fruit, resemble a garment, head-dress, ornament, or other article used by ourselves! To take the head-dress first: we have two pretty plants known as skullcaps, because the calyx looks exactly like the headgear of a venerable patriarch. The Latin name (*Scutellaria*) is derived from a word meaning 'a salver, dish, or waiter,' for the same reason. Every one knows the curious blossoms of the aconite, which have been named monkshood, or friar's cap, because they look so exactly like the cowl worn by the monks. The pretty flowers of the scabious, which adorn the fields and road-sides in autumn, are called blue-caps, and one might easily imagine the plants had borrowed a number of fairy tam-o'shanters to make themselves look gay. Then, in the gardens we have the Turk's-cap lily; and the term 'tulip' has nothing to do with two lips, but is borrowed from the East, and means a turban. If you have seen foreign gentlemen from Persia in their gaily coloured head-dress, you will at once see how appropriate it was to compare the richly coloured tulip to a dulband, or turban.

In the West Indies and South America there grows a very remarkable plant, the blossoms of which are so large that the Indian children place them on their heads

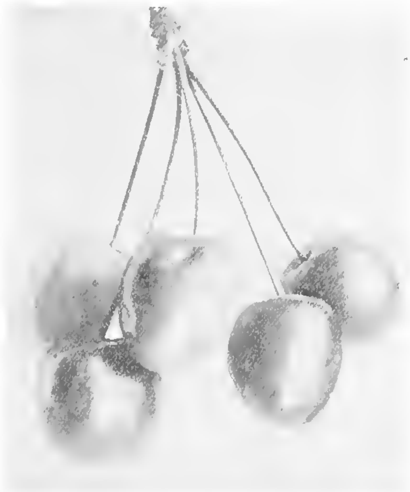

FIG. 147.—Cherries.

FIG. 148.—Gooseberries.

as caps when they are at play. In Brazil these flowers, rambling among the bushes, have all the appearance of gaily coloured pocket handkerchiefs laid out to dry. We have a relative of this plant in England (*Aristolochia*), but though the flowers are very curious they are small, and could only be used as a head-dress for a fairy.

I have told you about the lady's mantle and lady's smock, and if you can find a curious plant in your garden with red blossoms, known to gardeners as Dielytra, you will see a pair of Dutchman's breeches. Then we have among our native plants garters, ribbons, thimbles, darning needles, boots and shoes, shoes and stockings, and Our Lady's slipper (Fig. 56). There are plenty of bachelor's buttons and shirt buttons among our wild geraniums and campions, and the shepherd's purse need never be empty while silver pennies (Fig. 130), money flowers, the money-wort, and the penny cress are so abundant. The child who cannot carry a purse may find among the plants a rattle-box or a yellow rattle to keep him happy!

Now see how Flora imitates the different parts of the human body. The head of the dandelion, after all its seeds have been blown away (Fig. 73), is called the priest's crown, because it looks exactly like the shorn head of a Romish or Buddhist priest; while one of our thistles is called Friar's crown. Then we have fungi

known as Jew's ears, and seeds called Job's tears. These pretty red fruits, like pieces of coral with a black spot on them, are sometimes made into necklaces for children. We find in the hedgerows in autumn, especially in chalk and limestone districts, plenty of old man's beard—a name which is given to the long feathery awns of the clematis or traveller's joy. We have given an illustration of one species of this plant above (Fig. 61). Ferns and other plants are known as maiden hair, lady's tresses, or lady's hair, and one of our buttercups is called by the pretty name of goldilocks.

We have flowers called fingers and thumbs, and the foxglove (Fig. 23) is known as finger flower (and in German as finger-hut) from the similarity between the blossom and a thimble or the finger of a glove. There is a diseased form of turnip which is called by the farmers finger and toes. We have also a plant whose leaves are like a hand, on which account it is called Palma Christi; and if you ever visit an Eastern temple you will be pretty sure to see the curious citron known as Buddha's hand. We find among flowers a bleeding heart as well as love-lies-bleeding; and several such things as lungwort or liver-wort, which resemble those parts of the body. Then in our hedgerows we can almost everywhere come across the nipple-wort, and a variety of plants which bear the marks of milk, as the milk thistle. The last plant I will mention under this

FIG. 149.—Almonds.

FIG. 150.—Mistletoe.

head is all-bones, a name which is given to the pretty stitchwort, because its stalks are so skeleton-like.

Flora has spent much time in copying birds, insects, and animals. We have several kinds of toadflax, and if the young flowers of the common yellow kind are examined they will seem to be the exact reproductions of a little toad. The columbine and dove plant are so called because they look exactly like a pigeon, and the snakeweed recalls the wrigglings of a viper. Our commonest orchids are known in different parts of the country as goose and goslings, lamb's horns and ram's horns, or keat legs and neat legs. One large order oi plants is known as papilios, because the flowers resemble butterflies; and in this group our peas, beans, vetches, tares, and many similar plants are included. But it is among the orchids (Fig. 59) that we find the most striking resemblances to insects, birds, and other living things. One is known as the snipe, and another as the frog orchis. There are bees, flies, butterflies, lizards, and others in our own flora, besides one which resembles a man, and another which is called the soldier orchid.

Coming to the parts of the body, we find the snake's head, the buckshorn, the dragon's mouth, and the adder's-tongue. There is a swine's snout and a calves' snout, a hound's tongue, hart's tongue, lamb's tongue, and bird's tongue, as well as a plant called bugloss, which is

a botanical term meaning ox-tongue. The dandelion reminds us of the lion's teeth, which the jagged leaves resemble, and on which account it was named in French *dent de lion*. We have the dove's bill and stork's bill, as well as the cranesbill, or geranium; the cat's ear and the mouse ear, the cockscomb and the goatsbeard. There is one flower called the oxeye (Fig. 1), and another the pheasant's eye; while several plants, such as the speedwell and the little geraniums, are called cat's eyes and birds-eyes. We find leaves resembling the colt's foot and the calves' foot, and other plants are called hare's foot, cocksfoot, catsfoot, crowfoot, doves' foot, and wolf's claw. The tails are too numerous to enumerate, so I will only mention fox tail, dog's tail, cat's tail, hare's tail, mouse tail, horse tail, and mare's tail. These two latter are totally different plants, though at first they seem to be similar.

In conclusion, let me mention some natural and artificial objects which Flora has been pleased to imitate. She has several flowers which recall the orb of day, and are therefore named sunflowers. There is also a moonwort and a moon daisy (Fig. 4), besides the plant which yields those curious seed-vessels called silver pennies (Fig. 130), whose botanical name is Lunaria, from the Latin *luna*, the moon. The Star of Bethlehem is only one of many star-worts found in our flora, and we have also a globe-flower (Fig. 15), and a globe thistle, besides

FIG. 151.—Snowberry.

FIG. 152.—Spindle-tree.

some flowers called orbs. We have a plant called the bird's nest, and the wild carrot is often known as bee's nest because of the striking appearance of the head when in fruit. We have some plants known as spoon-worts, because their leaves are like a spoon, and some fruits and flowers which are known as keys (Fig. 127). There are plants for warriors, such as arrowheads, sword grass, calcitraps, and flags, while a whole order is known as crossworts, or crucifers, because the four petals are arranged in the form of a cross.

We find cheeses, butter and eggs, witches' butter, a brandy-bottle—the fruit of the yellow water-lily (Fig. 116, and see coloured plate)—and a snuff-box! There are several kinds of ladder, as Jacob's ladder, and a plant called church spires, or church steeple. We have love-in-a-mist, devil-in-a-bush, and St. Catherine's flower. These three are one. Venus has her hair or tresses, and a comb with which to dress the same; a basin in which to wash, and a looking-glass in which to admire her beauty.

Many flowers are named after their golden hue, as gold apples, gold cups, gold knobs, and golden chain; the last being the very appropriate name of the laburnum.

Nor have the great and noble been omitted, for we have prince's feathers, the king's cup and knob, or button, his spear and the mace, and the Crown Imperial

to adorn his noble brow! What more could we desire? When my young readers have found all the plants I have named in this chapter, and have discovered their proper or scientific names, and learned their orders and characters, they may begin to think they are botanists.

CHAPTER XXII

MEMORY AIDS

IT is granted that the names by which the botanist knows the different plants are often long, ugly, hard to pronounce, and difficult to remember. Yet we could not become real botanists if we did not know the plants by any other names than those which I have catalogued in the last chapter. If we go to France or Germany, to India or China, we shall find many plants which are familiar to us at home, but they will be known by other names, yet when we come to study them as botanists do we shall have no difficulty, because the scientific name is the same all over the world. In different parts of Germany I found the common poppy (*Papaver Rhoeas*). It has more than half a hundred different names among the common people, but every botanist knows what flower is meant when the proper or scientific name is used. When we find the same flower growing in the gardens of the Chinese we have no difficulty in naming it, whatever it may be called by a Chinaman, because it has a scientific name which is everywhere understood.

A gentleman once wrote to me from America, asking

me to tell him the secret by which the names of plants and their characters might be remembered. But I had no secret to give. If you are born with a naturalist's gift you will need no secret aids. But if you find it hard to remember names and characters, the best way will be to work out a system of your own.

I was once teaching some young people botany, and found that they had a difficulty in distinguishing some plants which were very much alike. So I set to work to find out a way by which they should succeed. I do not propose to repeat here the lessons I gave them, but I will give just one illustration of my method, so that others may have a hint how to proceed.

I have just spoken of the poppy, so we will use that as our text. In the English flora there are several plants which are all more or less closely allied to the corn poppy. These are classed together, and separated from all other flowers under the title Papaveraceae. This we call the Order. Within this order we find five different kinds or genera of plants. The names of these genera are Papaver, Meconopsis, Roemeria, Glaucium, and Chelidonium; but though they are closely related they each have their distinctive characters. For example, all have two sepals to form the calyx. All have four petals in the corolla, while in each the stamens are numerous. But the first two genera differ from the remaining three in their seed-vessels. Their stigmas are arranged in a

FIG. 153.—Grapes.

FIG. 154.—Hazel-nuts.

radiate fashion, and the pods or capsules form a knob or head, whereas in the last three they are long or horn-shaped.

No difficulty can be experienced here when we have obtained a little knowledge of botany, and it is only when we come to the identification of the true poppies that the trouble begins. There are about half a dozen poppies found in England, but only four of these can be regarded as truly wild. Now it so happens that these four are at first sight almost exactly alike. I want some simple means of knowing them apart and instantly deciding which species I have found. Is there any ready means of deciding? If I look at the roots they are all alike, and the books tell me that they all have many flowers on stems which are hairy, or bristly and leafy. All have scarlet flowers, and the differences in colour are not usually a useful guide. The leaves are in each case cut up into little shreds, pinnatifid or bi-pinnatifid, and it begins to look as though it would be a very difficult matter to make them out.

But when the flowers have fallen the seed-vessel remains. In the poppies this is always in the form of a head or capsule, and it is by looking at the capsule that we are able immediately to say which species we have found. These four poppies fall into pairs. One pair is common, the other is rare. One pair has round heads, or what we may call apple-shaped; the seed-

vessels of the other pair are clavate, or pear-shaped. Finally, two begin with capital letters, and two without, while in one pair the capsules are covered with bristles, or are called hispid, and in the other they are smooth. Now if we can arrange these facts somehow so that they will fix themselves on the memory, we shall never have any further difficulty with the poppies. First we ask what are their names. The botany book gives them as follows: *Papaver Argemone*, L., *P. hybridum*, L., *P. Rhoeas*, L., and *P. dubium*, L. Now if we take the initial letters a, h, r, d, we find that they form the word 'hard.' It is easy to learn, h stands for hybridum, a for Argemone, r for Rhoeas, and d for dubium.

But h also stands for hairy, and as hybridum and Argemone stand together in our arrangement we have another clue. Two are hairy, and these are the first pair. Rhoeas and dubium must therefore have smooth capsules. We saw that two were apple-shaped and two pear-shaped. One of each is smooth, and one of each is hairy. Now r stands for round as well as for Rhoeas, and Rhoeas is spelt with an h, so Rh stands for round and hairy, and also for Rhoeas and hybridum. So the aid is complete. Or we might remember that as the two pairs of names begin with capitals and without them, the round ones are represented by a capital R and a common h, then the pear-shaped must also be represented by the capital letter A and a common d.

Let me put this in another way. There are four scarlet poppies—

H for *hybridum* and hairy.

A for *Argemone.*

R for *Rhoeas* and round.

D for *dubium.*

Rh, then, stands for *Rhoeas*, round and smooth, and *hybridum*, round and hairy ; therefore Ad must stand for *Argemone*, pear-shaped and hairy, and *dubium*, pear-shaped and smooth.

Of course, such tricks as these are not necessary for the botanist, but as there is so much to be learned before one can be truly called a botanist it is allowable to try and discover such simple devices for aiding the memory. It will now be your duty to try and work out other mnemonics for yourselves. And I can only wish that you may find in the pursuit as much pleasure as I myself have done.

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